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Newsletter

Hawaiian Botanical Society

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VOLUME 26(1) APRIL 1987

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1987

Executive Council

President: Rylan N. S. Yee, Bishop Museum

Vice-President: Isabella A. Abbott, University of Hawaii

Treasurer: Derral Herbst, U.S. Fish and Wildlife Service

Secretary: Christa Russell, Bishop Museum

Directors:
Donald P. Gowing, Bishop Museum
Dan Palmer, University of Hawaii
Charles H. Lamoureux, University of Hawaii

Committees (appointed by the Executive Council)

Membership: Donald P. Gowing, Chair

Newsletter:
Clyde Imada, Chair
Clifford Smith, Editor
Donald P. Gowing

Conservation:
Elizabeth Powell, Chair
Art Medeiros, Maui

Science Fair:
William Brostoff
Ryan N.S. Yee

Native Plants:
Clifford Smith, Chair
Ken Nagata
Evangeline Funk
John Obata
Art Medeiros, Maui

NEW MEMBERS -- LIFE MEMBERS -- POTENTIAL MEMBERS

In recent months, the Society has welcomed as new members the following:-

David G. Fisher, Honolulu

June Gutmanis, Waianae

Paul Higashino, Volcano

Maria Leu, Ewa Beach

G. Clarke Leavitt, Honolulu

William Kramer, Honolulu

Steven Perlman, Honolulu

and has congratulated the following on their becoming life members:-

M. S. Doty

John H. R. Plews

Elsewhere in this issue; there is a listing of the Membership and institutional subscribers as of 6 April 1987. Do you know of persons interested in Hawaiian/Pacific botany whose names are not on the list? We would welcome them, too, as members.

Meetings are open to the public, but only members receive the Newsletter, meeting notices, and other announcements.

Former members, whose year of last dues was 1985 or earlier, no longer receive the Society mailings, but will be put back on the mailing list on our receipt of current dues. These are $7.50 for regular membership, $4.00 for students, $10.00 family, and $150.00 life (individuals only). We will be glad to have them with us again!

The Membership Committee would appreciate your suggestions on potential members, and will send an invitation and application to join. Just drop us a note c/o Department of Botany , Univiersity of Hawaii at Manoa, 3190 Maile Way, Honolulu HI 96822, or call in the address and name to Tel. 848-4175 (Gowing/Botany Dept./Bishop Musuem).

Donald P. Gowing
Membership

Hawaiian Botanical Society Membership/Subscription List May 1987

R	Abbott, Isabella A.
R	Allison, Allen
R	Anderson, Elizabeth K.
H	Anderson, Donald
L	Angus, Donald
H	Baker, Gladys
R	Baker, Raymond E.
R	Bornhorst, Heidi L.
R	Bridges, Kent W.
S	Bruegmann, Marie M.
H	Burr, George
H	Bush, William M.
R	Canfield, Joan
R	Carr, Gerald D.
L	Char, Winona P.
R	Cherry, Hilde K.
L	Chock, Alvin K.
R	Clarke, Gar
R	Clay, Horace F.
F	Conant, Sheila
L	Crispin, Charles H.
R	Crivellone, Carmelle F.
R	Davis, Clifton J.
F	Decker, Bryce & Shirley
H	Degener, Otto
L	Doty, Maxwell S.
S	Doyle, Michael
L	Elliott, John C.
S	Ellshoff, Zella E.
R	Evans, Evan C. III
R	Evenson, William E.
R	Fisher, David G.
R	Flynn, Tim
R	Fosberg, F. Raymond
R	Fujii, Susumu
R	Gardner, Donald E.
L	Gay, Ruth
S	Gerrish, Grant
R	Gill, Lorin T.
F	Gowing, Donald P. & Mary
R	Green, Ted
R	Gutmanis, June
R	Hall, John B.
R	Hartmann, Richard W.
L	Herbst, Derral
R	Higa, Patricia E.
R	Higashino, Paul
L	Hoe, William J.
R	Holt, Alan
R	Holt, Mrs. Venus G.
H	Hoshino, Helene M.
R	Imada, Clyde
S	Ikagawa, Toshihiko
R	Ishikawa, Sharon
R	Jacobi, James D.
L	Kapalua Botanical Garden
R	Kefford, Noel P.
F	Kirsch, Mr. & Mrs. Oscar
R	Koga, Ronney E.
H	Krajina, Vladimir J.
R	Kramer, William R.
H	Krauss, Beatrice
R	Krauss, Noel L. H.
F	Kunisaki, John & Susan
R	Lau, Joel Q. C.
R	Leavitt, G. Clark
R	Leu, Maria E.
L	Lewis, Jane E.
R	Lum, Charles W.
R	Maka, Jean
H	Manelsdorf, Dr. & Mrs. A.
R	Manhoff, Mr. Milton
S	McDermid, Karla J.
R	Mew, Randal K. T.
R	Marks, Loy M.
R	McKenney, Michael P.
R	Miller, Harvey A.
F	Miranda, David W.
R	Mitchell, John H.
L	Mizuno, Geary S.
F	Montgomery, Steven
L	Mueller-Dombois, Dieter
F	Mull, William & Mae
R	Nakasone, Henry Y.
S	Neher, Beate
S	Newman, Audrey
R	Nishida, Jean I.
R	Obata, John
R	O'Connor, Peter & Alenka Remec
R	Onaga, Kelsey
R	Orr, Karthryn J.
L	Pai, Inez Kong
R	Palmer, Daniel D.
R	Perlman, Steven P.
L	Plews, John H. R.
S	Powell, Elizabeth
H	Pratt, J. Scott B.
R	Pyle, B. Leilani
R	Rick, Charles M.
R	Robbins, Catherine Lee
R	Roelofs, Faith M.
R	Russell, Christa

R	Sagawa, Yoneo
H	St. John, Harold
R	Scheuer, Paul J.
R	Shields, Thomas M.
F	Siegel, Sanford M. & Barbara Z.
R	Simon, Christine
R	Smith, Clifford W.
L	Smith Lucy Cranwell
R	Sohmer, Sy H.
R	Souza, Wayne H.
R	Stoner, Martin F.
R	Tabata, Raymond S.
R	Teramoto, Linden T.
L	Teraoka, Wesley
L	Theobald, William L.
L	Tokushige, Walter
R	Tomich, P. Quentin
H	Tongg, Richard C.
F	Towata, Mark & Eileen
R	Ward, Deborah J.
R	Ward, Jerome V.
R	Watanabe, Thomas M.
F	Weissich, Mr. & Mrs. Paul
R	Wills, Clinton H.
H	Wentworth, Juliette
F	Wester, Lyndon
R	Wilson, Kenneth A.
R	Woolliams, Keith
R	Yee, Rylan S. N.
R	Yoshinaga, Alvin Y.
S	Yun, In Sun
L	Zimmerman, Elwood C.
I	Archives, Hawaiian Bot. Soc.
I	Libr., Botany Dept., U of H
I	Ebsco Industries Inc.
I	Libr., A. R. Mann (Cornell)
I	Libr., Michigan State Univ.
I	Libr., Univ. Calif., Davis
I	Libr., Botany Div., DSIR
I	Libr., Gray Herb., Harvard
I	Libr., New York Bot. Gard.
I	Libr., Waimea Arb & Bot. Gard.
I	Libr., Herbarium Pacificum
I	Libr., Bishop Museum
I	Libr., Univ. Hawaii
I	Libr., Geneva Bot. Gard.
I	Libr., Hawaii Nat. Hist. Assoc.
I	Libr., Smithsonian Inst.
I	Libr., Pac. Trop. Bot. Gard.
I	Libr., Hawaii State Libraries

* Classification: R = Regular Membership; S = Student;
F = Family; H = Honorary; L = Life;
I = Institutional

* * *

PROGRESS TOWARD BIOCONTROL OF BANANA POKA

*Dr. George P. Markin, U.S. Forest Service, Institute of Pacific Islands Forestry, has recently submitted to the State Plant Quarantine Division a request to release a biological control agent of *Passiflora mollissima*. The agent is a South American moth, *Cyanotricha necryia* Felder (Lepidoptera: Dioptidae), whose larvae feed on the leaves of banana poka.

Dr. Donald E. Gardner, National Park Service, University of Hawaii at Manoa is concluding tests using a seedling wilt disease, *Fusarium oxysporum* f. sp. *passiflorae*. He is very encouraged by the results and is preparing the necessary documentation to support the request for release.

Both scientists note that other agents will be needed in order to adequately control this weed.

A NOTE ON THE EARLY HISTORY OF THE NEWSLETTER

A note from Alvin K. Chock, former President of the Society, gives some information of the early history of the Newsletter, and this may be of some interest to the membership. He writes from the Hague, where he is Regional Director of the USDA-APHIS-PPQ Program with the Embassy:-

"The idea began in December 1961, when I was elected Secretary of the Society. Charlie Lamoureux was elected President, along with the perennial Treasurer, Bill Bush. Up to this time, the Secretary was responsible for sending out the meeting notices, which were printed post cards. (Duplicating them caused all sorts of problems with the printing technology which we then had). I asked Charlie, and later the Board, if anyone objected to the meeting notices being printed on a hectograph machine at the Department of Botany, on 8-1/2 x 11 inch sheets, with a few notes added. I was encouraged to do this by the Board, and as you know, as time progressed, the size increased. Eddie Bryan of the Bishop Museum suggested that permanency was of importance, and volunteered the mimeograph machine at the Museum. We also printed the masthead, which is a drawing of Lobelia yuccoides which my wife, Yona, adapted from Otto Degener's Flora Hawaiiensis.

"In those days, I did everything -- wrote the articles, edited the contributions received, typed the stencils, ran the mimeograph machine, collated the pages, and affixed the mailing labels (or had them run off on the addressograph). Yona assisted me in collating and mailing the issues.

"It's now been 25 years and 4 months since I started the newsletter. I'm very pleased, as Founding Editor, to know that the Hawaiian Botanical Society Newsletter is still active and going strong. I want to congratulate the Society on its 25th Anniversary of this publication, for continuing it as the news media of Society activities, and also as a means of publishing short articles on Hawaiian Botany. One important spin-off from the inception of the Newsletter was the increase in non- resident members, since the Newsletter provided them a reason to be a member of the Society."

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RELEASE OF A BIOCONTROL AGENT AGAINST THE KOA HAOLE PSYLLID

The State Plant Pest Control Division has been granted approval to release a small wasp as a biocontrol agent against the alien psyllid (Heteropsylla cubensis) which has been responsible for the setback of koa haole (Leucaena leucocephala.) The wasp will be released initially in the Kona and South Point areas of the Big Island and later in the Waimea area of Kaua'i. Both release sites are pastureland.

HAWAIIAN BOTANICAL SOCIETY
Minutes for the January, 1987 Meeting

President Yee called the meeting to order at 7:35 p.m. The minutes of the December meeting were read and approved. The treasurer reported that the balance as of Jan. 1, 1987 was $3299.48.

The membership chairman reported the acceptance of one new member to the Society, Mr. Clarke Levitt.

The newsletter chairman reported that one article had been received from Randall Mew on the cultivation of strand plants for the next issue of the newsletter.

Under old business, there was some discussion on the proposed amendment to increase the life membership dues from $100 to $150 in 1987. The amendment was passed unanimously.

Bill Bush reported that he had audited the Society's books and found them in excellent order.

President Yee thanked Zella Ellshoff for the excellent job she has done in preparing the refreshments for the meetings for the past few years and announced that for the 1987 meetings members are asked to volunteer to take care of refreshments. A sign up sheet will be available after the meeting.

Plant of the Month speaker was Mr. Clyde Imada of the Bishop Museum Botany Dept. who demonstrated how to mount herbarium specimens.

Speaker of the Month was Dr. Charles Lamoureux whose talk was entitled "Botanical Experiences in Indonesia".

The meeting was adjourned at 9 p.m. and members then enjoyed refreshments.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the February, 1987 Meeting

President Yee called the meeting to order at 7:30 p.m. The minutes of the January meeting were read and approved. The treasurer reported that the balance as of Feb. 1, 1987 was $3504.94.

Mr. Steve Perlman was nominated and accepted as a new member of the Society.

There was no old business.

Under new business President Yee reported that Waimea Arboretum Foundation had asked the Neal-Miller Fund to support their education program with a $250 grant. The Society members voted their approval that the members of the board of the Neal-Miller Fund consider the grant request.

Also under new business President Yee proposed the establishment of two new Society committees. The present commiittees are membership, audit, conservation, native plant, and the newsletter committee. The two proposed committees are [general] botany and a horticultural committee. The committee chairpeople would report on any new or interesting developments relevant to their area of interest at the monthly Society meetings, and would contribute articles for the Society newsletter. Volunteers to chair these committees were being sought.

Vice-president Abbott introduced the Plant of the Month speaker, Dr. Don Gardner of the National Park Service and the U.H. Botany Dept., who spoke on fungal infections of Hawaiian Vacciniums. Speaker of the Month, Dr. S.H. Sohmer, chairman of the Bishop Museum's Botany Dept., spoke on his botanical excursions in Papua New Guinea, one of botany's last frontiers.

The meeting was adjourned at 9:00 p.m. and members then enjoyed refreshments.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the March, 1987 Meeting

President Yee called the meeting to order at 7:30 p.m. The minutes of the last meeting were read and approved. The treasurer reported that the balance brought forward was $3510.68.

The membership committee chairman reported the acceptance of two new members to the Society; Paul Higashino and William Kramer, and a new life member, John Plews.

Under old business President Yee announced that the trustees for the Marie Neal Fund had approved the new name, Neal-Miller Fund. Also, the trustees had decided they would appoint a committee to decide on the criteria necessary for grant proposals, and they were considering various ways of investing the money in the Neal-Miller Fund.

For new business, President Yee announced that beginning in April Botanical Society members must provide refreshments as this was the last meeting the executive board would provide them. A sign up sheet would be available at the end of the meeting.

Pseudophagopteris caroliniana was the subject of Dr. Florence Wagner's plant of the month presentation. This fern doesn't really climb but "leans" on other plants. Individual plants may reach 7 m in length.

Dr. Warren H. Wagner, Jr., speaker of the month, presented an interesting and informative talk on "Problems in Hawaiian Ferns".

The meeting was adjourned at 9 p.m. and members then enjoyed refreshments.

* *

NEW WEED TREE

Evangeline Funk
Department of Botany
University of Hawaii at Manoa

The U. S. Navy natural resources baseline inventory of the Naval Magazine at Lualualei was the first such study conducted in this restricted access site. The study covered flora, fauna, and water resources. During the survey several items of botanical interest were found. The most exciting was a small ridge on the western flank of Pu'u Kānehoa which was almost entirely covered with Santalum ellipticum var. ellipticum Gray. There were plants of all size classes including seedlings and several large seed bearing adult trees.

Down slope from the sandalwood, on several sheer ridges were large numbers of Portulaca lutea Soland. ex Forst. plants. These were growing on such inaccessible shelves that they had escaped the large goat populations that at one time occupied this area. The Portulaca colony comprised several hundred plants.

A new weed tree in the family Euphorbiaceae was also found. This tree has now been identified as Mallotus philippensis (Lam.) Muell.-Arg. Some individuals were well over 7 m in height. The exact population size could not be ascertained but many trees are scattered about below Kolekole Pass. Since this area was the site of several Department of Forestry planting trials, it is surmised that seeds of this plant were brought in accidently during the reforestation effort. There are no records of Mallotus having been intentionally planted (Skolman 1983). The trees appear to withstand the dry conditions and many were setting seed.

Skolman, R. G. 1983. Plantings on Forest Reserves of Hawaii 1910-1960. Computer print out State of Hawaii Department of Land and Natural Resources files.

CONSERVATION CORNER

Dr. Wayne Gagné
Education Specialist
Bernice P. Bishop Museum

Dr. Gagné, a noted entomologist, botanist, and conservationist, will author a column dealing with various conservation matters in this and future issues of the Newsletter. The following letter to Mr. W. W. Paty, Chairman of the Board of Land and Natural Resources was submitted in January. However, it contains a lot of information on the current status of the State's Natural Area Reserves System that will be of considerable interest to members of the Society.

"Dear Mr. Paty:

"At a joint meeting of the Conservation Council for Hawai'i and the Sierra Club regarding the future of the State Natural Area Reserves System (HNARS), featuring the HNARS Commission Chairman, we were disturbed to learn that the previous Administration's biennial budget recently submitted to the Legislature does not request any appropriation for the management of HNARS. This means that the State's 18 Natural Area Reserves thus far designated from 108,461 acres of public lands (see DLNR Report to the Governor 1984-85, pg. 6, attached) will remain unprotected as "paper parks." This also means that some of the finest segments of our natural biotic diversity, specifically selected by the DLNR to protect a cross-section of our living heritage will continue to be degraded by an onslaught of alien weeds, animals, off-road vehicles, etc.

"The 1970 legislation which established the NAR System (Chapter 195) was due in part to the support of former Sen. Nadao Yoshinaga. It stated that the Commission was to have the power to develop ways and means of extending and strengthening preserves, and to advise on any matter relating to the preservation of Hawaii's unique natural resources. Recently, Botanist and Commissioner Dr. Clifford Smith wrote that resource management plans should be prepared for each reserve.

"As Federal Judge Samuel King has indicated in his recent ruling which orders the removal of mouflon sheep from the Mauna Kea mamane forest, the critical habitat of the Palila, there are areas in our state that are simply too sensitive for continued mangement under the prevailing "multiple use" concept. Thus, we were encouraged to learn that you have directed the DLNR and the Attorney General not to appeal the Court's ruling on this issue. Many of our natural areas are likewise too sensitive to permit excessive populations of introduced feral mammals. Without active management favoring Hawaiian species, natural areas will continue to be degraded, and extictions of native plants and animals they contain will surely follow. Hawai'i already has the nations' most dismal record in this respect.

"The National Park Service and the Nature Conservancy of Hawai'i are providing exemplary guidance in their approaches and activities in resource management of the natural area under their jurisdictions. This management is not without costs, however. There has been a heartening volunteerism to help these two entities in this activity, and one which has been lacking for HNARS.

"We request that you consider recommending that Governor Waihee request $500,000 to begin the management of HNARS. Below, we outline specific Natural Area Reserves needing immediate management and specify the actions needed to eliminate or ameliorate continuing threats. Some of the management functions may be done by contract workers but the HNARS program urgently needs two new field-oriented positions: a Resource Management Specialist and a Resource Management Assistant. Some management actions such as construction of a livestock guard on the road to Mt. Ka'ala are relatively simple to construct, yet would have beneficial spin-off in protecting fragile natural resources higher on the mountain.

"a) Kuia, Kauai NAR: This exceptionally rich native forest is being degraded by black-tailed deer and feral pigs. Fencing these out of the reserve is urgently needed.

"b) Hono O Na Pali, Kauai NAR: There is a small infestation of Koster's Curse (Clidemia hirta), O'ahu's most serious alien weed in its watershed, which needs immediate removal to prevent spread to the rest of this natural area and the remainder of Kauai.

"c) West Maui NAR:
Feral pigs pose an immediate threat to the almost pristine bogs on the tops of Pu'u Kukui and Mt. Eke, which contain a wealth of rare native plants, such as silverswords and greenswords. These bogs need immediate protective fencing. In the Lihau and Panaewa Sections at lower elevations, fire pre-suppression is needed to protect native shrublands and grasslands.

"d) Ka'ena Point, O'ahu NAR: This coastal ecosystem is being seriously degraded by uncontrolled off-road vehicles. Expeditious emplacement of large boulders around the acquisition of a key land parcel will provide a strategic access control point.

"e) Mt. Ka'ala, O'ahu NAR: Immediate removal programs are needed for several alien weeds which are degrading the summit bog area (blackberry, kikuyu grass and strawberry guava).

"f) Pahole, O'ahu NAR: Recently completed alien plant surveys need to be followed up by complete removal of Koster's curse and manuka infestations. This natural area has a large number of extremely rare native plant species.

"g) Hanawi, East Maui NAR: Feral pigs are rapidly degrading some of the most pristine upland rainforest and watershed in the State. This results in contamination of Haiku's drinking water supply because of the almost complete disturbance of the understory of this forest. The destruction of plant diversity results in other adverse spin-offs. Several endangered birds, namely the Po'o-uli, 'Akepa and Nukupu'u, communities, are declining towards exticion in these threatened areas. The people of Maui are mobilizing to force resolution of this issue, now at an apparent stalemate because of hunters who insist on maintenance of high pig populations in spite of the negative impacts. This NAR is simply too remote to be utilized by pig hunters, but a pig control program is essential to preserve the very features which distinguish it.

"h) Manuka & Kipahoehoe, Hawai'i NAR: Introduced weeds are spreading from the edges of the highway which bisects these reserves. Feral pigs are abetting the spread of certain of these weeds, in addition to degrading the quality of them. Immediate attention to elimination of these perturbations is necessary to uphold the purposes for which these natural were established in the first place.

"i) Pu'u Maka'ala, Hawai'i NAR: Feral pigs and weeds are degrading this important natural area reserve for native birds, plants and invertebrates. These need removal after fencing. The adjacent Ola'a Tract has an infestation of the noxious banana poka which needs close monitoring to prevent its spread into this natural area.

"j) Pu'u Ali'i, Molokai NAR: This natural area is the habitat for the extremely endangered Moloka'i 'Omao or Thrush. An aggressive ungulate removal effort is needed immediately to arrest further degradation. This area also lies within Kalaupapa National Historic Park, so federal support may be available for management.

"k) Laupahoehoe, Hawai'i NAR: This important area of endangered forest bird habitat containing Koa/'Ohi'a forests is widely invaded by banana poka and banyan, and is densely populated by feral pigs. As an important portion of the largest native forest bird habitat in the state, curtailment of these problems and restoration of the forest is essential. This will be a long-term, costly effort, and will become increasingly difficult the longer we delay. This reserve is also an important watershed for the Hamakua coast.

"1) Pu' O Umi, Hawai'i NAR: This reserve encompasses watershed 'ohi'a rain forests along the summit of the Kohala Mountains above Kamuela. Degradation of these areas by feral pigs and weeds will continued to have negative repercussions for Kohala's water supply, as well as the native biota within the reserve.

"We would be happy to meet with you to discuss your Department's support of this fundamentally important need to protect the public's living heritage. In any event, we are available to provide background on our groups' concerns over the lack of adequate protection for the State's Natural Area Reserves System and the on-going degradation of over three-quarters of them as detailed above."

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POSITION ANNOUNCEMENT

PACIFIC SYSTEMATIC BOTANY

The Department of Botany, Smithsonian Institution, is recruiting for one three-year term curatorial position. Candidates must be U.S. citizens and should have an active research program in monographic, floristic, and biogeographic Pacific botany, and a demonstrated interest in one or more large tropical terrestrial plant groups. This interest should be documented by publications and oral presentations. The individual should have experience to conduct interdisciplinary research with other biologists on Pacific islands biota. The successful candidate will be expected to spend 50% time on research and curation of existing Pacific island collections. Salary will be at the GS-11/13 level ($27,172-$38,727).

There are ample opportunities for development of field programs, use of a world-wide herbarium and associated library with emphasis on tropical floras, and interdisciplinary collaboration with members of other natural history departments. Special facilities include SEM, TEM, computer services, a biochemical laboratory, functional morphology laboratory, greenhouse, and the Smithsonian publication series. Current staff interests include systematically oriented terrestrial and marine botany, palynology, morphology, anatomy, cytology, and cladistics.

Interested applicants should send a statement of general research goals, a curriculum vitae, Office of Personnel Management Standard Form 171 (available on request), names of three references and a set of reprints to: Smithsonian Institution, Employment Office, Announcement Number: 87-300-F 900 Jefferson Drive, SW, Washington, DC 20560. Applications must be received by the closing date, July 31, 1987, and should indicate this announcement number, 87-300-F, on the SF-171.

The Smithsonian Institution is an Equal Opportunity Employer.

HAWAII'S EXTINCT, ENDANGERED, THREATENED AND RARE PTERIDOPHYTES, 1987

W. H. Wagner, Jr.
Department of Botany
Division of Biological Sciences
University of Michigan
Ann Arbor MI 48109-1048

EXTINCT (possibly or probably)

Huperzia haleakalae
Botrychium subbifoliatum
Asplenium leucostegioides
Diellia mannii
D. laciniata
D. unisora

ENDANGERED

Huperzia haleakalae X *somai*
H. somai X *sulcatum*
H. mannii[2]
Isoetes hawaiiensis ined.
Ophioglossum concinnum
Adenophorus periens
Pteris lidgatii
XLindaeosoria flynnii ined.
Pityrogramma Xmckenneyi ined.
Ctenitis squamigera
Diplazium molokaiense
Thelypteris boydiae
Marsilea villosa

THREATENED

Huperzia nutans
Ophioglossum nudicaule[3]
Asplenium fragile
Diellia erecta

VERY RARE AND RARE

Psilotum Xintermedium ined.[3]
Microlepia oenotrichioides ined.
Gonocormus prolifer
Thelypteris Xpalmeri ined.[4]
Dryopteris crinalis
D. tetrapinnata ined.
Cystopteris douglasii
Doodia lyonii
A. hobdyi ined.
A. schizophyllum
Diellia falcata

---

1. List includes not only nothospecies (taxa of hybrid origin) but still unpublished names for new or revised taxa.

2. This may have a subspecies on the north-east slopes of Mauna Kea.

3. These, and perhaps others of the taxa given here, are easily overlooked or confused with other species. Their evaluation is based upon existing documentation and our present knowledge of their occurrence.

4. This taxon may be of very recent origin. There is some evidence that it is spreading. If it becomes more widespread, it should be taken off the list.

NEAL-MILLER FUND

The Neal-Miller Fund of the Hawaiian Botanical Society is an eleemosynary fund that distributes funds from time to time for projects appropriate to the interests of the Hawaiian Botanical Society. There are four trustees, and the current president of the Hawaiian Botanical Society serves ex-officio.

Over the years the Neal-Miller Fund has supported activities of the Hawaiian Botanical Society, various educational programs, contributed botanical awards and recognitions, as well as projects of various other scientific organizations when they had a botanical orientation. There are no firm rules as to which projects or persons will be supported, each request is evaluated for its merit, its cost and its appropriateness to the interests of the Society. Requests for funds usually arise from a motion approved by the members of the Society at one of its monthly meetings.

The fund came into existence in 1967 when Marie Neal left five hundred dollars in her will for the Hawaiian Botanical Society. Her will included relatives and friends, but also reflected her broad scientific, artistic and social interests in that it included the Bernice P. Bishop Museum, The First Congregational Church in Southington, Connecticut, Smith College in Massachusetts, the Hawaiian Academy of Science, The Hawaiian Botanical Gardens Foundation, the American Association of the Advancement of Science, the Honolulu Academy of Arts, the Honolulu Y.W.C.A., the Honolulu Symphony Society, and The Wilderness Society.

On Feb. 17, 1967 the Hawaiian Botanical Society received a check for $475.15 from Hawaiian Trust and because a major beneficiary of her will had died before Miss Neal, and because the will had taken this possibility into account, another check for $6,916.12 was distributed to the Society as a remainderman. The fund has been used for the goals of the society and has increased in value to approximately $16,500.

Marie Catherine Neal was born in Southington, Connecticut, December 7, 1889. She graduated from Smith College in 1912 where she received a B.A. degree. She took a secretarial course at Hartford and later became Secretary of the Geology Department of Yale University. In addition she ran the office and did the editorial work for the Connecticut Geological and Natural History Survey where she worked closely with Dr. Herbert E. Gregory, Professor of Geology. When Professor Gregory was appointed as Director of the Bernice P. Bishop Museum in 1919 he invited Marie to work at the museum. At that time she wanted a position in Botany, but accepted a position with Dr. Cooke working with land shells. She became Assistant Malacologist on January 1, 1920 and she collected, sorted, identified and catalogued land snails. She published a paper on the Helicinidae in 1934. Plants remained her love and in her off hours she observed, collected and studied Hawaiian plants. She had an interest in sea weeds, and under Dr. J. B. Pollack, exchange professor from the University of Michigan, made an intensive study of the reef algae near the Waikiki Aquarium. This work resulted in her being awarded a master of science from Yale University in 1925, and this work was published as Bishop Museum Bulletin 67.

Miss Neal made a plant collecting trip to New Zealand in 1925 and early 1926. In 1935 she made a trip around the world during which she visited herbaria and botanical gardens. In August 1935 she spent two weeks camped on Mauna Kea near Lake Waiau at about 13,000 feet. During this time she and Constance Hartt, the only two women in the party, explored the upper slopes of the mountain for plants. Their joint paper, "The Plant Ecology of Mauna Kea, Hawaii" (Ecology 21 (2), April 1940) reported the results of their work.

She and Constance Hartt were close friends. They shared apartments and in 1938 built their own home, surrounded by flower gardens, in Nuuanu Valley.

She was interested in ornamental plants and weeds in gardens throughout Honolulu, and her interest and work in this area resulted in the publication of a floral guide entitled "In Honolulu Gardens" in 1928. This book was very popular and a revised edition was printed in 1929.

Miss Neal was appointed Botanist-in-Charge at the Bishop Museum January 1, 1930, although she had already assumed that responsibility in the last half of 1929.

She produced many articles for the Garden Journal, Elepaio, Lurefax, Paradise of the Pacific and Pacific Science, and contributed information on Hawaiian plants for the Hawaiian-English dictionary, by Pukui and Elbert, as well as a section on medicinal plants in "Outline of Hawaiian Physical Therapeutics", by Handy, Pukui and Livermore. In addition to her publications she was always willing to share her knowledge of Hawaii's plants with anyone from an interested amateur to professionals in need of assistance.

Marie Neal is best known for her most important work "In Gardens of Hawaii" first published in 1948. Its complete revision was published in 1965, and she was able to see an advanced copy just prior to her death on June 6, 1965.

Miss Neal was highly regarded by her botanical colleagues and was made a life member of the Hawaiian Botanical Society, the Friends of Foster Garden, and the Hawaii Weed Conference.

A more detailed biography of Marie Neal's life was written by Edwin H. Bryan, Jr. and published in the Newsletter of the Hawaiian Botanical Society Vol IV, (4), October, 1965.

The second contributor to the Neal-Miller fund was Carey D. Miller who upon her death November 4, 1985 left $14,000 to the Hawaiian Botanical Society. Her broad interest in the community and in scientific organizations was expressed by her also including the Friends of Foster Gardens, Bishop Museum Association, University of Hawaii Foundation for the Carey D. Miller Award, Young Women's Christian Association, Kindergarten and Children's Aid Association, The Outdoor Circle, Hawaiian Historical Society, Pacific Orchid Society and the South Dakota Memorial Art Center in her will.

Carey Dunlap Miller was born in Boise, Idaho in 1893. She grew up on her parents ranch in Idaho, attended a one-room school until the sixth grade and then attended the public schools in Boise. Because of her father's death she found it necessary to support herself, and she attended a business college to prepare herself for part-time work.

She attended the University of Idaho for one year and then transferred to the University of California at Berkeley where she majored in nutrition and graduated with honors in 1917. She taught for one year at Washington State College in Pullman, then resigned to work in a Boise hospital where she hoped whe would be helpful during World War I. She then taught courses in elementary nutrition at the University of California. She returned to Boise because of her mother's illness and worked as a stenographer, and then later taught at the University of Idaho for one semester.

She used all of her savings and borrowed money to go to Columbia University in New York City where she received a masters degree in 1922. At this time she was invited to the University of Hawaii as chairman of the Home Economics Department where she served in that position for 23 years. After this she continued to teach nutrition courses and direct the graduate program in food and nutrition research. At the time of her arrival the University consisted of Hawaii and Gartley Halls and a few wooden structures. During her early years here there were no special facilities for animal experiments and it was neccessary for her to convert a dining room to house white rats and guinea pigs. She did research regarding the anti-scorbutic effects of guava juice at a time prior to the identification of vitamin C.

In 1929 when the Federal Agricultural Experiment Station was incorportated in the University of Hawaii she was appointed Specialist in Food and Nutritional Investigations.

During her sabbatical leaves she took graduate work at the University of Washington and at Yale University. She also made several trips to Europe and one around the world visiting research laboratories and scientists in many countries. She also travelled in the Pacific and Japan for scientific purposes.

Her research was extensive and diverse. She did studies involving the basal metabolism of young men and women of various races in Hawaii. She published many papers defining the nutritionsl values of Hawaii's foods including many fruits, fishes, taro, coconuts, limu, and home grown ethnic groups, and the food values of portions commonly used. She co-authored the popular book "Some Fruits of Hawaii" with Catherine Bazore and Mary Bartow in 1936. This very popular book is her best known work and has had several revisions with the editions of recent years being called "Fruits of Hawaii."

She retired from the University of Hawaii in 1958 at which time the University honored her achievements and renamed the home economics building the Carey D. Miller Hall.

Miss Miller was a popular academician and was known as the "dean of nutritionists in Hawaii". She had an international reputation as an expert in the composition and nutritive value of Hawaiian and Oriental foods and was a member of many scientific and honor societies including the American Institute of Nutrition, Sigma Xi, Phi Kappa Phi, American Home Ecomomics Association, American Diatetic Association, and she was a Fellow of the American Assocaition for the Advancement of Science.

From 1924 she lived in Manoa valley with her friend and companion Miss Ada Erwin who taught home economics at Punahou School. At their home they entertained students, staff, friends and distinguished scientists from all over the world, especially those interested in the field of food and nutrition. At their home they kept a lovely garden with flowers, trees and shrubs from which they enjoyed the view of Manoa Valley.

Her interest in plants was shown by a beautiful and meticulously maintained garden. This garden was full of trees, shrubs, flowers and vegetables of many kinds, but her particular interest were yellow orchids of several varieties. She grew yellow orchids in all sizes and shapes including miniatures, and took it upon herself to make her own flower pots, because the only pots available commercially at that time were made of red clay. She was interested in pots that drained well and introduced pots with feet to Hawaii. She also created beautiful ceramic slabs to which she attached hapuu and her miniature yellow ondicium "dancing ladies." Her house, lanai and garden were full of beautifully maintained plants, and the view from her dining room through her lanai and into her garden was splendid.

She was a member of the Hawaiian Botanical Society for several decades and served as an officer during its early years. She regularly attended meetings until recent years.

Dan Palmer, Trustee Neal-Miller Fund

BIOCONTROL OF FUCHSIA

Donald E. Gardner
CPSU/UH Botany Department
University of Hawaii at Manoa
Honolulu, Hawaii 96822

The control of *Fuchsia magellanica*, which had been introduced to the Thurston Lava Tube area of Hawaii Volcanoes National Park, and is now spreading in the rain forest along Crater Rim Drive, has long been a Park resource management objective. In 1979 I reported the occurrence of fuchsia rust in Hawaii (Gardner, 1979), which was discovered attacking and defoliating roadside shrubs of *F. hybrida* in the community of Volcano, adjacent to the Park. Since the initial report, the rust disease has become common on *F. magellanica* in the Park, discoloring the leaves and causing some defoliation on this species.

Within the past year, an eriophyid mite of unknown origin has become conspicuously evident on *F. magellanica* both within the Park and in Volcano Village. Its rapid spread in these areas has been observed and documented by Clif Davis. The mite has also been reported on Stainback Highway, although I have not confirmed this report. Mites of the eriophyid group are typically associated with plant galls and similar growth abnormalities, which they cause by injecting feeding toxins into the plant tissue. The effects of the mite on fuschia in the Park and surrounding area are striking: production of fleshy galls on the leaves and twigs, which cause severe distortion. Affected tissue is red rather than the normal green. The specific identity of the mite is not known, but is currently under study by an expert in this group at the University of California.

No study has yet been made of possible interaction between the mite and the rust disease in attacking fuchsia, similar to that suggested by Leeper and Beardsley (1973) between the introduced koa psyllid (*Psylla uncatoides*) and the endemic koa rust fungi (*Uromyces* spp.). I have observed the rust associated with mite galls in the Park. The effects of these volunteer biocontrol agents in reducing the competitive vigor of fuchsia in Park, as well as in surrounding areas, will be interesting to follow.

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NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

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PĀPALA KĒPAU, PISONIA UMBELLIFERA (FORSTER) SEEMANN

F. R. Fosberg
Botany Department
National Museum of Natural History
Smithsonian Institution
WASHINGTON DC 20560, USA

Studies during the preparation of the treatment of family Nyctaginaceae for the new Manual of the Flowering Plants of Hawaii revealed an astonishing amount of variation in the tree commonly called Pisonia umbellifera, or in Hawaiian, Pāpala kēpau.

I exclude from this discussion the two other clearly distinct but similar Hawaiian species, often confused with P. umbellifera, namely Pisonia sandwicensis Hillebrand and Pisonia brunoniana Endlicher, the quite different Pisonia grandis R. Brown, and the newly described, closely related Pisonia wagneriana Fosberg.

Pisonia sandwicensis may be recognized by its oblong to elliptic leaves with thickish relatively long petioles, staminate flowers with well-over 15 stamens, pistillate flowers with exserted elongate fimbriate stigmas, internodes in branchlets gradually shortened, not condensed into an aggregate node. Pisonia brunoniana has bisexual flowers with plicate, scarcely lobed perianth, fruiting perigones or anthocarps with a short tubular prolongation of the perigone inside the lobes when in fruiting condition. Pisonia wagneriana has pointed stminate buds, pilose staminate cymes, and long broadly spatulate, cuneate-based leaves. Pisonia grandis has gradually shortened internodes, ovate acuminate leaves, pistillate perianth closely surrounding the style.

Pisonia umbellifera was first found by the Forsters, father and son, on Tanna, in the New Herbrides (Vanuatu), on Captain Cook's Second Voyage Around the World. Several specimens of their collections of this species, rather fragmentary, exist in the British Museum (Natural History), in London and others collected by their colleague, Sparrman, (which I have not seen). Plants have been referred to this taxon from over an enormous geographic range, extending from Hawai'i and Eastern Polynesia, to Samoa, Fiji, Melanesia, Micronesia, the Bonin Islands, the Philippines, Indonesia, the Andaman Islands, Mauritius and the Comores. The plants that I have seen from this geographic expanse are extremely varied, but it is very hard to draw lines between the variations. It has been tried, and many names exist, 18 of which are listed by Stemmerik (1964) as synonyms of P. umbellifera.

Heimerl (1913, 1937) described three species in this complex, from the Society Islands, alone, and I have a fourth in mauscript. At least one other certainly exists in Samoa-Fiji, and apparently, the Solomon Islands, besides P. umbellifera, itself. These are not very strong species and have generally been included in P. umbellifera, of which latter, we have seen very few specimens from its type region, the New Hebrides.

The Hawaiian plants usually referred to P. umbellifera are exceedingly diverse, yet with the rather abundant available specimens it is hard to define tangible entities. Specimens tend to be fragmentary and without field population studies it is seldom evident which staminate and pistillate plants belong together, and which fruiting plants belong with which flowering ones. Even after excluding the reasonably definite P. wagerniana the problem essentially still remains.

The name Pisonia forsteriana Endl. ex Walp. & Schauer, was based on Hawaiian material. I have not seen type material of this, which has been generally considered the same as P. umbellifera (Forst.) Seem. The names Pisonia excelsa Bl., and P. macrocarpa Presl, based on specimens from Java, also not seen by me, have also been applied to Hawaiian plants.

My conclusion, for now, in light of Skottsberg's (1936) detailed discussion, is to follow him and retain the Hawaiian plants (except the new Pisonia wageriana) in P. umbellifera, in spite of some small differences from the one modern New Hebrides collection that I have studied.

Following are some remarks on several Hawaiian forms of P. umbellifera, sensu lato.

A Wai'anae, O'ahu, fruiting sheet (Christophersen 3701) with tiny anthocarps, less than 2 cm long, and very acute, erect to spreading, perianth-lobes directed attention to at least two rather notable different flowering forms from the same region. It seems inadvisable to guess on the basis of only vegetative characters to which one the single fruiting specimens belongs.

Forms with extremely long and slender anthocarps exist, or existed, in Nu'uanu Valley, O'ahu, and especially on the Kīlauea River, Kaua'i, and Puiu Kī, Hāna, East Maui, but, again matching flowering material with these is inconclusive. Discontinuous variation in petiole length and leaf base in conspicuous, but again this does not correlate with other variables.

One can suggest that local botanists, well-placed to make repeated observations, revisit marked trees, and collect material in different stages -- unopened buds, flowers, and fully formed fruits -- with observations, recorded on the labels, as to range of inflorescence variation on the same tree, flower color and odor, and leaf texture. Long-term records of the developemnt of the curious "aggregate-nodes" that seem to be a practically constant feature of this species, of how long the leaves last from first formation to falling, and of bird dispersal of the sticky fruits, would all be desirable. Attempts should be made to decide which staminate plants go with which pistillate, whether bisexual flowers, with pollen, occur, whether there are definite flowering seasons, and what are the pollinators.

With such observations we may, eventually, be able to understand this group of species.

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LEGISLATIVE NEWS

The 1987 Legislature passed several bills pertinent to the State's Natural Area Reserve System.

One bill amends the natural area reserves system law to emphasize that the Department of Land and Natural Resources (DLNR) is to preserve, manage, and protect the reserves system. It allows new natural area reserves to be established by gift, devise, grant, reimbursement to cooperators, exchange, or purchase, including conservation easements. It also authorizes the Department to cooperate or contract with any governmental agency or private organization or individual in carrying out the purpose of this law. The department is to establish criteria for and implement a plan for selection, acquisition, management, protection, and use of natural area reserves. The bill was signed by the Governor on 2 July 1985.

The same bill amends membership of the Natural Area Reserves System Commission. It empowers the commission to advise public agencies of lands or natural resources under their jurisdictions which are appropriate for designation as natural area reserves. It provides rule-making powers. It requires natural area reserves to be held in trust and not be alienated except to another public use upon a finding by DLNR of an imperative and unavoidable public necessity. By this bill, DLNR is to prepare a comprehensive reserves system management plan based on the provided criteria.

A second bill establishes the natural area reserve fund for the heritage program, to be administered by DLNR and used to implement the natural area reserves law. It defines the heritage program to mean a program with a comprehensive natural resources inventory data base for public information, which shall include the location of rare plants, animals and natural communites in the State. It appropriates for the natural area reserve fund for transfers to the heritage program, with partial matching funds from private sources. The bill was signed by the Governor on 2 July 1985.

If all goes well NARS will have $437,500 for FY87 and FY88. Current plans are to hire several botanists to conduct surveys and prepare management action plans.

Another bill requires DLNR to initiate changes to conservation district boundaries in order to include high quality native forests and habitats of rare native species of flora and fauna within conservation districts. Amends land use commission provisions relating to districting and classification of lands to provide that conservation districts shall include areas necessary for conserving indigenous or endemic plants, fish, and wildlife, including those which are threatened or endangered.

CULTIVATION AND PROPAGATION OF SELECTED COASTAL PLANTS AT THE WAIKĪKĪ AQUARIUM

Randal K. T. Mew
Waikiki Aquarium
University of Hawaii
2777 Kalakaua Ave.
Honolulu, HI 96815

INTRODUCTION:

A solution to the problem of the rapidly vanishing native flora of Hawai'i may be found in their cultivation and propagation. Such a solution is now being implemented at the Waikīkī Aquarium.

In order to illustrate that the present lifestyle of our society is contributing to the loss of our native coastal ecosystems, Waikīkī Aquarium staff and volunteers made many field trips to various points on O'ahu. Data noting the location, growth habits, and the surrounding community of our target plants were logged, however, because of the ever-present fear that increased visitation would create more stress on these fragile ecosystems, these logs were not publicized (Kimura & Nagata 1980). A total of 23 such expeditions were made from February 21, 1985 to November 13, 1986, which included Ka'ena Point, Pounders Beach, and a multitude of other beaches along Kamehameha Highway on the north shore of O'ahu, to Makapu'u, Sandy Beach, Waimänalo Beach Park, and numerous other beaches along Kalaniana'ole Highway on the south shore of O'ahu.

A general trend we noted was that much of the coastal flora of O'ahu has been displaced either by construction or possibly trampled to death by man and/or his machines (Tabata 1980, Degener 1932). Construction of the 1200 ft. long Sandy Beach parking lot in October 1931 made this beach more accessible to sightseers, fishermen, and bodysurfers, ath the expense of the removal of much of the valuable coastal flora found in this area (Clark 1977). To cite another example, on our most recent field trip to the Ka'ena Point lighthouse on November 13, 1986, we roughly estimated a two-thirds reduction in the number of 'ohai (Sesbania tomentosa Hook. & Arnott) plants on the Mokulé'ia side of the lighthouse, as compared to our expedition of February 11, 1985. Also noted were huge mounds of debris, with clam shells, unburned charcoal, beer cans, bottles, and a multitude of other items marking man's presence there.

Therefore, with this in mind, I would like to introduce you to the present research being conducted on our native coastal flora communities of O'ahu at the Waikīkī Aquarium. Cultural problems along with general growth characteristics are noted as well as successful propagation techniques.

PLANT LIST:

1) Achyranthes splendens Mart. ex Moq.- -no common name, Amaranthaceae, endemic

Cultivation: Responds well to bi-weekly applications of a general fertilizer; high susceptibility to nematodes, i.e. root-knot (Meloidogyne spp.), lesion (Pratylenchus spp.) and reniform (Rotylenchulus reniformis) nematodes were isolated in the plant and soil samples sent to the University of Hawaii Cooperative Extension soil testing service. Oxamyl has been a successful nematicide.

Propagation: Easily by cuttings using a plant hormone with misting.

Source: Waikīkī Aquarium.

2) Euphorbia skottsbergii Sherff- -koko, 'akoko, Euphorbiaceae, endemic

Cultivation: Does well in partial shade.

Propagation: By seed, however, we have not been too successful in isolating the seeds before they drop off the plant.

Source: Waimea Arboretum.

3) Capparis sandwichiana DC.- -capers, pua pilo, Capparidaceae, indigenous

Cultivation: Grows well in soils high in sand and organic matter.

Propagation: By cuttings in a 50/50 mix of peat moss and perlite. No success with seedling.

Source: Pounders Beach.

4) Gossypium sandvicense Parl.- -ma'o, Hawaiian cotton, Malvaceae, endemic

Cultivation: Very susceptible to a variety of pests such as aphids, scales, mealy bugs, and white flies. A regualr spraying program with Malathion is essential.

Propagation: By seed. The hard, impervious seed coat should be broken to allow moisture in for germination. A knife can be used to cut the seed coat, but take care not to damage the seed embryo. No success with cuttings.

Source: Ka'ena Point, Makapu'u, and Waikīkī Aquarium.

5) Heliotropium anomalum Hook. & Arnott - -hinahina, beach heliotrope, Boraginaceae, indigenous

Cultivation: Must be grown in beach sand. Grows best with organic matter near root zone or 4-5 inches below soil surface. More vigorous plant growth follows salt water applications to mimic the ocean spray.

Propagation: By runners from the established mother plants rooted in sand under a mist system for two weeks. Very difficult to isolate the seeds because of its miniature size.

Source: Makapu'u Beach Park and Waikīkī Aquarium.

6) Heliotropium curassavicum L. - -nena, Boraginaceae, indigenous

Cultivation: Grows best in a porous soil containing high amounts of sand.

Propagation: By see, scattering them over the soil surface. Deep seeding inhibits germination.

Source: Sandy Beach and Waikīkī Aquarium.

7) Impomoea brasiliensis (L.) Sweet - -pōhuehue, Convolvulaceae, indigenous

Cultivation: Must be grown in a porous soil in direct sunlight.

Propagation: Horizontal cuttings root very easily in two weeks under mist.

Source: Sandy Beach and Waikīkī Aquarium.

8) Hibiscus saintjohnianus Roe- -St. John's Hibiscus, Malvaceae, endemic

Cultivation: Slow grower susceptible to many insects such as aphids, mealy bugs, scales, and white flies. A regular spraying program with Malathion is essential.

Propagation: Low percentage yield using cuttings. Must use a rooting hormone.

Source: Lyon Arboretum.

9) Lipochaeta integrifolia (Nutt.) A. Gray- -nehe, Asteraceae (Compositae), endemic

Cultivation: Grows well in any type of soil that is well-drained.

Propagation: From cuttings or runners, with rooting at the nodes.

Source: Sandy Beach and Waikīkī Aquarium.

10) Myporum sandwicense A. Gray- -naio, bastard sandalwood, Myoporaceae, indigenous

Cultivation: Slow grower, somewhat susceptible to nematodes.

Propagation: Slow germination by seeds, taking from six to fifteen months. Fruits must be harvested in the white succulent stage, and the fleshy skin peeled off.

Source: Makapu'u, Ka'ena Point, and Waikīkī Aquarium.

11) Nototrichium viride Hillebr.- -kulu'ī, Amaranthaceae, endemic

Cultivation: Vigorous grower with soil amendments and bi-monthly applications of a general fertilizer.

Propagation: By cuttings with Hormex #1, put under mist for three weeks. Seeds should take, however, more experimentation is needed.

Source: Heidi Bornhorst and Waikīkī Aquarium.

12) _Pandanus odoratissimus_ L.- -pūhala, Pandanaceae, indigenous
Cultivation: Grows well in any well-drained location with ample room to spread.
Propagation: By seed.
Source: Waikīkī Aquarium.

13) _Portulaca lutea_ Sol. ex G. Forster- -'ihi, Portulacaceae, indigenous
Cultivation: Must be grown in beach sand. Does well with organic matter 4-5 inches below soil surface.
Propagation: By seed, or cuttings placed in sand under mist.
Source: Pounders Beach and Waikīkī Aquarium.

14) _Scaevola coriacea_ Nutt.- -naupaka, Goodeniaceae, endemic, rare
Cultivation: Initial slow grower.
Propagation: By cuttings placed in a 50/50 peat moss and perlite soil mix under mist.
Source: Heidi Bornhorst and Waikīkī Aquarium.

15) _Scaevola taccada_ (Gaertn.) Roxb.- -naupaka-kahakai, Goodeniaceae, indigenous
Cultivation: Very hardy and aggressive grower. Applications of salt water to the plants produces internodal shortening and darker green foliage, resulting in a more compact and attractive hedge.
Propagation: By cuttings, or by seed when fruit is in the white fleshy stage.
Source: Waikīkī Aquarium.

16) _Sesbania tomentosa_ Hook. & Arnott- -'ohai, Fabaceae (Leguminosae), endemic, rare
Cultivation: Slow grower, very susceptible to nematodes. Oxamyl has been used to control nematodes.
Propagation: Seeding, with an extremely low germination percentage.
Source: Heidi Bornhorst.

17) _Sesuvium portulacastrum_ (L.) L.- -'ākulikuli, Aizoasceae, indigenous
Cultivation: Does best in sandy soils with a high percentage of organic matter, in full sun.
Propagation: Runners from the mother plant.
Source: Ala Wai Canal, Paikō Beach Park, and Waikīkī Aquarium.

18) _Sida fallax_ Walp.- -trailing 'ilima, Malvaceae, indigenous
Cultivation: Vigorous grower. Must be in full sun to flower profusely. More nematode resistance than the cultivated upright-growing _Sida fallax_.
Propagation: Germination from seeds in three to eight months. Low germination percentage.
Source: Makapu'u and Waikīkī Aquarium.

19) Solanum nigrum L.- -pōpolo,Solanaceae, indigenous(?)
Cultivation: Rapid growth from seedling to seed-bearer.
Propogation: Germinates in eleven days planted near soil level.
Source: Diamond Head lookout and Waikīkī Aquarium.

20) Tephrosia purpurea (L.) Pers.- -'auhuhu, Fabaceae, indigenous
Cultivation: Requires an area protected from strong winds.
Propogation: By seed.
Source: Waikīkī Aquarium.

21) Vigna marina (Burm.) Merr.- -nanea, beach pea, Fabaceae, indigenous
Cultivation: Easily grown annuyal provided that there is an ample supply of water available.
Propagation: By seed, germination in six days.
Source: Waikīkī Aquarium.

22) Vitex ovata Thunb.- -pōhinahina, Verbenaceae, indigenous
Cultivation: Vigorous grower with irrigation.
Propogation: Runners or seeds. More work needs to be done with seeding.
Source: Waikīkī Aquarium.

23) Wikstroemia uva-ursi A. Gray- -'ākia, Thymelaeaceae, endemic
Cultivation: Slow grower which does best in full sun. Responds well to applications of Hawaiian salt, producing more vigorous growth.
Propagation: By seed. The red fleshy portion of the fruit should be peeled off. Germination is fairly uniform in 21 days. Also, cuttings may be used along with a rooting hormone.
Source: Waikīkī Aquarium.

This introduction into the current research being conducted at the Waikīkī Aquarium only touches upon the general aspects of our Hawaiian Coastal Flora studies. Detailed data has been omitted for simplification; with continued research I will provide more details on the cultivation and propagation of each plant in future writings.

Many thanks to the following individuals for reviewing these materials and providing much-needed information, as well as support and encouragement needed to continue my research: Ray Tabata of the University Sea Grant Marine Advisory Program, Ken Nagata of Lyon Arboretum, Heidi Bornhorst from the Honolulu Zoo, David Miranda of Sunshine Nursery, and Daryl Imose from the Waikīkī Aquarium.

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MICONIA CALVESCENS ON HAWAII

Miconia calvescens (Melastomataceae), commonly called velvet tree, is a native of Mexico. It has now become firmly established in wet habitats on the island of Hawaii. The date of introduction is unknown but Carlsmith apparently planted it at Onomea. It became such a pest that he asked the 4H Club to eradicate it. They were not successful and the very small seeds have almost certainly been carried downslope in streams.

The plant is being used as an ornamental in Hilo (from which it has already escaped) Ainaloa and Leilani Estates. It is also in the Hilo Botanic Garden. This weed should be eradicated as soon as possible to avoid our rain forest being overrun as has happened in Tahiti and Moorea.

Joyce Davis
P.O. Box 645
Volcano, HI 96785

CONFERENCE ANNOUNCEMENTS

The New York Rainforest Alliance will sponsor a conference: "Tropical Rainforest: Interdependence and Responsibility" from October 16 - 18, 1987 at Hunter College, Lexington Avenue at 68th Street, New York City

Noted economists, scientists, conservationists, and corporate representatives will gather to discuss the ways we in the developed world are connected to and dependent on the tropical forest environment, and actions that can be taken to preserve this environment for future generations.

Keynote speakers include:

Dr. Ghillean Prance, New York Botanical Garden
Dr. Norman Myers, Environmental Consultant & Author
Dr. Thomas Lovejoy, World Wildlife Fund
Dr. Peter Raven, Missouri Botanical Garden
Dr. Noel Brown, United Nations Environment Programme and over 40 others

The registration fee for the three-day conference fee is $60.; to register or obtain further information, contact:

New York Rainforest Alliance
320 Park Avenue, 30th floor
New York, NY 10022
(212) 906-1694

* *

WORKSHOP ON ISLAND ECOSYSTEMS CONSERVATION EDUCATION

A workshop on island ecosystems conservation education, to be brought about through interaction of educators, interpreters, natural resource managers, researchers, administrators, and other groups, is scheduled for November 2-6, 1987 at Kilauea Military Camp in the Hawaii Volcanoes National Park.

We are planning a poster session to run throughout the first 4 days of the workshop, and are soliciting materials relating to conservation education for display from agencies and others interested in sharing their materials. Please call Chuck Stone at (808) 967-8211 if you would like more information on this session.

Because we are striving for participation and attendance from diverse affiliations, and because space will be severely limited, we are asking by way of this announcement for PRE-REGISTRATION of folks interested in attending. Write to: Research Scientist, Hawaii Volcanoes National Park, P.O. Box 52, Hawaii National Park, HI 96718. Or, if you prefer, you may respond with a phone call to the office of the Research Scientist, (808) 967-8211.

POTENTIALLY INVASIVE PLANTS
OF HAWAII VOLCANOES NATIONAL PARK

Lani Stemmermann
P.O. Box 308
Volcano, HI 96785

The disruptive impact of non-native plant species on the natural communities of Hawaii Volcanoes National Park is one of the major concerns of park managers. Attempted eradication of certain taxa has proven costly and ineffective once populations are widespread. The objective of this report was to identify and locate populations which have not yet been considered serious pests, but which, because of habit, reproductive characteristics, or disruptive behavior elsewhere, may be of future concern.

Between May and October 1985 the major roads through the Park and adjacent subdivisions, trails in the Kilauea region, the Park residence area and Kilauea Military Camp were surveyed. Plants listed in Fosberg (1975, Revised Check-list of Vascular Plants of Hawaii Volcanoes National Park, CPSU Tech. Report No. 5) with red, fleshy, sticky, or winged fruit or seeds, as well as those of viney habit have all been considered as potentially expansive. Plants were mapped, and specimens collected to augment the Park's herbarium when vouchers were not already in the collection.

Park areas were more exhaustively surveyed than adjacent subdivisions which were only superficially examined, but which will continue to be a source for new potentially invasive species.

The list of plants which were considered potentially invasive is attached (Table 1). Thirty nine species in 24 families were evaluated.

Given an unlimited budget, the following species should be considered for eradication within the Park: _Albizzia_ sp., _Desmodium_ sp., 3) _Fuchsia arborescens_, 4) _Gomphocarpus physocarpus_, 5) blooming ivy at Ainahou, 6) _Paederia foetida_--effectively treated by Oct. 1985, 7) _Pittosporum undulatum_, 8) _Persea americana_. The potentially most problematic, treatable species in areas immediately adjacent to the Park include: 1) _Buddleja madagascariensis_, 2) _Senecio mikanoides_. Two bird-dispersed species occur outside the Park which will likely eventually be a problem in the Park: 1) _Clidemia hirta_, 2) _Clusia rosea_. Populations which should be occasionally monitored include: _Luculia gratissima_, 2) _Cortaderia_ sp., 3) _Acacia_ at the Volcano Post Office. 4) _Leptospermum scoparium_ in Volcano Village and on Wright Rd.

Table 1. Alien flowering plants found in or adjacent to Hawaii Volcanoes National Park which are potentially invasive. Family abbreviations are as follows: ACA - Acanthaceae, AIZ - Aizoaceae, AQU - Aquifoliaceae, ARA - Araceae, ARL - Araliaceae, ASC - Asclepiadaceae, BIG - Bignoniaceae, CAP - Caprifoliaceae, COM - Compositae, ELA - Elaeagnaceae, GRA - Gramineae, GUT - Guttiferae, LAU - Lauraceae, LEG - Leguminosae, LOG - Loganiaceae, MEL - Melastomataceae, MYR - Myrsinaceae, MYT - Myrtaceae, ONA - Onagraceae, PIT - Pittosporaceae, ROS - Rosaceae, RUB - Rubiaceae, SAX - Saxifragaceae, SCR - Scrophulariaceae.

SPECIES, FAMILY, ORIGIN	FRUIT	HABIT	PARK DISTRIBUTION	HAWAI'I DISTRIBUTION	REASONS FOR CONSIDERATION AS PEST
Abrus precatorius "black-eyed susan" LEG Tropics	toxic red seeds	vine	Widespread in Park lowlands near Kalapana	Widespread, mesic lowlands in Hawaii	Vine, but probably not expanding in range
Acacia sp. LEG ?	legume pod	tree	-	Planted at the Volcano Post Office	Naturalized as Acacia melanoxylon between Hosmer's Grove and Waikamoi Preserve on Maui illustrates the potential success of exotic, nitrogen fixing Acacia species at high elevation in Hawai'i.
Acacia koa LEG Hawai'i	brown legume pod	tree	widespread, planted throughout Park	Naturally distributed on deep ash soils, not native in	Spreading in many of the areas where it was planted.

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				many of the areas in HAVO where planted.	
Ardisia crispa "Hilo holly" MYR S. Asia	red berry	low shrub	near Volcano House, specimens from Sandalwood trail & steam vent area	Naturalized in some lowland areas, e.g. Waiakea below 1000 ft.	Red fruit, but this is usually a lowland plant, and may survive at higher elev. only in the proximity of steam vents.
Albizzia sp. LEG ?	legume pod	tree	Chain of Craters Road, below the big bend	Common in some lowland areas, e.g. Nanawale.	These become large trees, but with poor dispersability.
Asarina erubescens SCR Mexico	capsule	vine	Volcano House	Naturalized in dry areas, Kona, but not a problem.	Vine, but probably not much problem.
Buddleja madagascariensis LOG Madagascar	yellow berry	liana	-	Apparently rapidly expanding populations in Volcano Village, at Volcano Dump, Mountain View & Glenwood.	Sprawling liana seemingly capable of considerable expansion, possibly into rain forests such as near Thurston.
Clidemia hirta MEL Jamaica	purple berry	shrub	-	Especially 'Oahu, but other islands also. Naturalized, lowland Hilo	Bird dispersed berries with numerous fertile seeds. Likely to spread to Naulu forests from

				and Puna on Hawai'i.	adjacent infested lands in Puna, more detailed mapping and monitoring recommended.
Clusia rosea "autograph plant" GUT W. Indies.	red seeds in dehiscent woody capsule	tree	-	Naturalized in lowland Hilo & Kona, appears to be moving rapidly, common ornamental.	This often establishes epiphytically, likely will eventually invade Kalapana section of the Park, but not apparently naturalized nearby yet.
Coreopsis nuecensis COM N. Amer.		herb	KMC to Mauna Loa strip Road	Usually an ornamental	Apparently spreading in the Park, conspicuous when in flower, but probably not community-destructive.
Cortaderia sp. "pampas grass" GRA S. Am.?	plumose awned	large clump grass	cultivated in Golf Course subdivision	Not known to be naturalized.	Not naturalized, but keep an eye on this, numerous indigenous species all over New Zealand.
Cotoneaster pannosa ROS China	orange drupe	shrub	Near Hqts, Residence area and KMC.	Volcano Village, Kula, Maui, Hualalai.	Orange-red fruit, may spread but has been in HAVO a long time.

				many of the areas in HAVO where planted.	
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Desmodium sp. LEG ?	sticky loment	vine	Exercise track, roadsides Keanakakoi to Puhimau, Hwy 11	Saddle Road, Puna	Seems restricted to roadsides but may spread to scrub vegetation. Likely spread during road work, and may not spread far off-road. However, pig dogs could carry seeds & runners into forest.
Eleagnus umbellata ELA Asia	red berry	shrub	eradicated between Volcano House & Park residence area.	Spreading in the region around Haunani Rd & Maile Rd intersection in Volcano Village	Will likely spread in Park. This can form dense thickets.
Escallonia macrantha SAX Chile	sticky	scandent scrub	Residence area	Volcano Village	Vine-like but not seen truely naturalized.
Fuchsia arborescens ONA Mexico	fleshy black berry	small tree	Escape Road near Hwy 11, residence area.	Volcano Village, ornamental.	Not seen truely naturalized, but fruit likely spread by birds.
Gomphocarpus physocarpus ASC S. Africa	silky-plumed seeds	shrub	Hilina Pali Road, Footprints sand-dunes, Kau Desert.	Naturalized in Puna and Ka'u.	Easily spreads by plumed seeds & likely on increase throughout dry areas in Park.

Hebe speciosa SCR N. Zealand	capsule	scandent shrub	residence area, Hqtrs.	Volcano Village, ornamental.	Reproduces vegetatively & therefore locally abundant.
Hedera helix "ivy" ARL Eurasia	black berry	blanketing vine	Residence area, KMC, 2 seedlings found near Thurston.	Ornamental all over Volcano.	Ivy rarely flowers, but flowers were collected in Volcano village, and at Ainahou, and seedlings found near Thurston. Flowering plants with more entire lvs than normal, not known if those represent a separate, sexier variety, or an adult morphology.
Ilex sp. AQU ?	red berry	shrub	-	18 mile marker, Hilo to Volcano Hwy.	Red fruit, small, but expanding population.
Ilex sp. AQU ?		shrub	KMC	-	Red fruit.
Jacaranda acutifolia BIG Brazil	winged seeds	tree	Residence area, ornamental	Naturalized in Kona	Easily wind-dispersed seeds, but volcano is likely out of its naturalizing range.

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Leptospermum scoparium "manuka" MYT N. Zealand	small air-borne seeds	tree	-	Naturalized, 'Oahu, Moloka'i. Ornamental Volcano Village & Wright Rd.	Easily wind-dispersed seeds. In New Zealand it colonizes recently burned sites.
Lampranthus glomeraturs "ice plant, akulikuli" AIZ S. Africa		herb	Residence area, KMC and Volcano House, Golf Course Clubhouse	Not known to be weedy.	Degeners have verbally expressed concern over this, based on extra-Hawaii distribution.
Lonicera japonica "honey suckle" CAP Asia	rare, black berry	vine	Ubiquitous in residence area, in Kilauea region of Park	Volcano Village, only naturalized near where planted.	I have never seen this fruit, but locally this can be a blanketing vine. Too common to control in Park.
Luculia gratissima RUB S. Asia	winged seeds	small tree	Near Volcano House, Thurston Lava Tube.	Ornamental, Volcano Village.	The seeds are described as winged, and therefore easily dispersed. Uncertain if the Thurston trees were planted or not.
Lupine sp. LEG ?	capsule	herb	Whiteaker (1985) on file w/ HVNP Resources Mmt. Division	Near Golf Course Clubhouse.	Not easily spread.

Melaleuca spp. "paper bark" MYT Australia	small wind dispersed	tree	-	Ornamental, Volcano. Naturalized	Easily dispersed seeds, difficult to explain why these are not more naturalized.
Paederia foetida "maile pilau" RUB S. Asia	berry-like	vine	Chain of Craters Road near Puhimau.	Blanketing vine in many wet, lowland forests.	Widespread in lowlands.
Panicum repens "Wainako grass" GRA Old World	grass seed	stoloniferous grass	Exercise track	Dense in wet pastures throughtout Hawaii.	Could be spread to forests by wet seeds on pig dogs.
Pittosporum undulatum PIT Australia	orange capsule with red seeds	tree	Golf Course Clubhouse, residence area, Whiteaker (1985).	Volcano Village ornamental.	Spreading from residence area, but being controlled. Plants still present in 1987.
Philodendron sp. ARA ?	rare	vine	Sandalwood trail	Occasional ornamental	Not likely to be a problem.
Persea americana "avocado" LAU Trop. Am.	large fleshy drupe	tree	Residences, picnic and parking places, Kipuka Puaulu, below Volcano House, Devast. Trail, Thurston, etc.	Ubiquitous volunteer where seeds have been discarded by people.	Man and pigs are the dispersal agents, and though this will never be aggressive, it can become an eyesore. Severe problem in Galapagos.

Leptospermum scoparium "manuka" MYT N. Zealand	small air-borne seeds	tree	-	Naturalized, 'Oahu, Moloka'i. Ornamental Volcano Village & Wright Rd.	Easily wind-dispersed seeds. In New Zealand it colonizes recently burned sites.
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Pyracantha spp. ROS China	red drupe	shrub	Abundant in Golf Course Subdivisions, scattered throughout Park.	Naturalized, Volcano, Kula	Red, bird dispersed fruit, pasture pest.
Senecio mikanoides COM S. Africa	plumed seeds	vine	-	Volcano Village, small population. Large populations, Mauna Kea, Kona.	Easily spread once established.
Thunbergia alata ACA Trop. Africa	4-seeded capsule	vine	-	Ornamental, Haunani & Hwy 11, & Golf C. Subdiv.	Vine, but probably not easily dispersed.
Thunbergia fragrans ACA India	"	vine	-	Ubiquitous, lowland Puna and Hilo, weedy.	Seems restricted to disturbed sites, probably not easily dispersed.
Wisteria sinensis LEG China	legume pod	vine	Near hula platform, Art Center.	Volcano to Hilo, ornamental.	Though a strong tall climbing vine, I have not seen this set seed.
Unknown ? ?	pink fruit	shrub	Loqez driveway	Not known elsewhere, H. Clay & H. St. John did not know this.	Pink, possibly bird dispersed fruit.

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HAWAII BOTANICAL SOCIETY

Report of the Treasurer
December 1, 1985 - November 30, 1986

Receipts:			
Dues	$ 724.75		
Life Memberships	300.00		
Gifts	5.00		
Interest	1106.24		
			$2,135.99
Expenditures:			
Postage	$ 246.64		
Newsletter Publication	573.56		
Science Fair Prizes	215.00		
Reproduction Costs	38.84		
			$1,074.04
Cash Flow:			$1,061.95
Net Worth of Society:			
December 1, 1985			$18,679.88
Change: Dec.1 - Nov.30, 1986			1,061.95
November 30, 1986			19,741.83
Bank Balances:			
Honolulu Federal S & L - Checking Account			
Balance Dec.1, 1985	$2,988.23		
Balance Nov. 30, 1986		$3,092.49	
			$ 104.26
First Federal S & L - Account #111764			
Balance Dec.1, 1985	519.60		
Balance Nov.30, 1986		551.31	
			31.71
First Federal S & L - Account #C-718689			
Balance Dec.1, 1985	15,172.05		
Balance Nov.30, 1986		16,098.03	
			925.98
Bank Balances Nov.30, 1986		19,741.83	
Change in Balances Dec.1, 1985 - Nov.30, 1986			$1,061.95

STATUS OF ENDANGERED HAWAIIAN PLANTS

July 1, 1987

Derral Herbst
US Fish & Wildlife Service
300 Ala Moana Blvd #6307
Honolulu, HI 96813

Taxa listed as endangered:	Historic Distribution:
Vicia menziesii Spreng.	Hawai'i
Haplostachys haplostachya var. angustifolia (Sherff) St. John	Hawai'i
Stenogyne angustifolia Gray var. *angustifolia*	Hawai'i
Lipochaeta venosa Sherff	Hawai'i
Kokia cookei Deg.	Moloka'i
Euphorbia skottsbergii var. *kalaeloana* Sherff	O'ahu
Panicum carteri Hosaka	O'ahu
Bidens cuneata Sherff	O'ahu
Schiedea adamantis St. John	O'ahu
Gouania hillebrandii Oliver	Maui
Kokia drynarioides (Seem.) Lewt.	Hawai'i
Gardenia brighamii Mann	O'ahu Moloka'i Lāna'i Maui Hawai'i
Achyranthes rotundata (Hbd.) St. John	O'ahu
Argyroxiphium sandwicense var. *sandwicense* (DC.) Hbd.	Hawai'i
Santalum freycinetianum var. *lanaiense* Rock	Lāna'i
Hibiscadelphus distans Bishop & Herbst	Kaua'i
Abutilon menziesii Seem.	Hawai'i Lāna'i
Mezoneuron kavaiense (Mann) Hbd.	Kaua'i O'ahu Maui Hawai'i
Scaevola coriacea Nutt.	Maui O'ahu Kaua'i Lāna'i Ni'ihau Moloka'i Hawai'i

Taxa presently being reviewed by Washington, D.C. office as candidate endangered species:

Remya mauiensis Hbd.	Maui
Cyanea superba (Cham.) Gray	O'ahu
Geranium arboreum Gray	Maui
Wilkesia hobdyi St. John	Kaua'i

Taxa with completed status surveys:

Adenophorus periens Bishop	O'ahu
	Maui
	Lāna'i
	Moloka'i
	Hawai'i
Munroidendron racemosum (Forbes) Sherff	Kaua'i
Dubautia herbstobatae Carr	O'ahu
Dubautia latifolia (Gray) Keck	Kaua'i
Drypetes phyllanthoides (Rock) Sherff	Kaua'i
	O'ahu
	Moloka'i
	Maui
	Hawai'i
Brighamia spp.	Kaua'i
	Ni'ihau
	Maui
	Moloka'i

Taxa with completed status surveys (cont'd):

Alectryon macrococcum Radlk.	Moloka'i
	Maui
	Kaua'i
Isodendrion hosakae St. John	Hawai'i

* *

GARDEN CLUB ANNOUNCEMENT

The Garden Club of Honolulu will be presenting a Symposium: SAVE HAWAII'S NATIVE PLANTS, NOW OR NEVER. The Symposium will open at the Honolulu Academy of Arts on Sunday, October 18, 1987. Registration begins at 3:30 p.m. The program runs from 4 to 6 p.m. and is free of charge. On Monday, registration is at 8:15 a.m. The program will start at 9 a.m. An open discussion between the speakers and the audience will begin at 2:25 p.m. with the program ending at 3 p.m. A ten dollar ($10.00) registration fee will be collected for Monday's session which includes lunch. For further information call the Garden Club at 988-7533.

BOOK REVIEW

MAMMALS IN HAWAI'I; A SYNOPSIS AND NOTATIONAL BIBLIOGRAPHY. SECOND EDITION. BISHOP MUSEUM SPECIAL PUBLICATION 76. BISHOP MUSEUM PRESS, HONOLULU. 375 pp. P.Q. TOMICH. 1986. $42.95.

This welcome revision of the standard reference on mammals in Hawai'i comes to us 16 years after the 238-page initial version. The topics of the revised volume remain the same, but there are important differences in emphasis. Most notable is the expanded treatment of marine mammals (about 12% vs 5% of the earlier content). The annotated bibliography of 1,500 entries comprises about 43% of the book (vs 36% previously). It is indicative of the author's wide range of interests but not necessarily directly related to Hawaiian mammals. Species accounts are about the same percentage of the book as in the initial edition (41% vs 43%). The introduction, a checklist, an index, and a section on perspectives in Hawaiian mammalogy, make up the rest of the volume.

The mammals of Hawai'i now include 1 volant (the Hawaiian bat), 2 marine littoral species (the northern elephant seal from Midway Islands has been added), 22 pelagic mammals (whales), and 19 terrestrial species, for a total of 44. The 19 terrestrial species were all brought to Hawai'i by the hand of man, so it is appropriate that the book treats strongly of native species which have been reduced because of the introductions and of conservation of the remaining species. The author's final paragraph in the introduction to the book deals passionately with Hawaiian environments today and should be read by legislators, teachers, bureaucrats, developers, conservationists, and all who make decisions by default or ignorance. Elsewhere (p.190), the view of mankind becomes fatalistic: "It is the nature of man to exploit his surroundings for economic or other gain, to ignore wisdom of the past, and to fail to recognize the extreme vulnerability to disturbance that is characteristic of island biotic communities." I would rather hope that the dedication, scholarship, and efforts in communication and conservation by individuals such as Quentin Tomich will eventually prove Hawai'i to be an example of how things can be done with future generations in mind.

The book is attractively presented with a range of fair to excellent black and white photographs scattered throughout, a map of the Hawaiian chain (p. 172-173), and sketches of whales (with a petroglyph man for scale) in the front and back. I was pleased to see that the author adopted the word "alien" in this edition, rather than sticking to "exotic" as in the first edition. It is appropriately a much more negative term. However, I wish that the use of Hawaiian names for introduced species (p.170-171) could be discontinued. Alien species do not belong with things Hawaiian, even words. The detailed treatment of many topics, especially in the species accounts, makes it difficult for less interested readers to quickly extract general information. Other sources for this level of knowledge (e.g. van Riper and van Riper 1982) would make a good companion to the more comprehensive effort.

The most recent reference I found in the book was a 1984 paper. Unfortunately, the time involved in the mechanics of publication and the considerable research and management activity in Hawai'i at present, has resulted in some species treatments being less up to date than others. Specifically, the information on pigs, goats, rats, and mongooses is not as complete as it might have been. References to efforts by the U.S. Fish and Wildlife Service, the Nature Conservancy, the National Park Service, and the State of Hawai'i could have received more emphasis; they show that progress, although slow, is occurring. Theses on pigs and goats were produced in 1983 and 1984 and a number of other references and accomplishments from these years and beyond should be included in the next revision. Part of the hope for the future in Hawai'i is certainly the current emphasis on alien mammal reserach and management and the success of these efforts in natural areas.

The blend of history, mammalogy, Hawaiiana, and conservation, together with the scholarship make the book a wealth of information for the educated layperson, scientist, land manager, and educator. Quentin Tomich's book should stand for years as a definitive reference to mammals in Hawai'i and an important source of conservation history for those who wish to learn and to avoid the mistakes of the past.

Charles P. Stone
July 20, 1987

NEWLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
HONOLULU HI 96822

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Newsletter
Hawaiian Botanical Society

VOLUME 26(3) NOVEMBER 1987

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1986

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ANNUAL REPORT OF THE SECRETARY FOR 1986

Ninteen eighty-six marked the 62nd year of the Hawaiian Botanical Society. The officers were:

President- Jane Lewis
Vice-president- Rylan Yee
Secretary- Christa Russell
Treasurer- Derral Herbst
Directors- Evangeline Funk
Dan Palmer
Isabella Abbott

The 1986 Society meetings were held at the Makiki Park Arts building.

The highlights of Society business this year included:

A constitutional amendment to allow the President or Vice-president to succeed himself or herself in office was approved. This amendment will allow the Society officers to sit for several years so that their experience can be effectively utilized.

The Society membership list was computerized on the Bishop Museum's herbarium Wang word processor.

Society members approved a resolution for a joint management agreement between The Nature Conservancy of Hawai'i and the Hawaiian Botanical Society to provide volunteer labor and scientific expertise for the protection of *Marsilea villosa* at Koko Head crater. A document proposing this species as an endangered species is in near final form.

Society members voted down a resolution to offer a reward for information leading to the capture and arrest of the person or persons who set the fire at Pu'uwa'awa'a, Kona Coast, Hawaii. It appears that the fire which destroyed several very rare plants had been deliberately set in three places along the road.

Dr. Cary Miller who passed away in 1985 left approximately $12,000 to the Botanical Society. The executive board proposed that these monies be combined with the Marie Neal funds. This proposal was approved effective in January 1, 1987.

President Lewis vacated the Society presidency in June to pursue graduate research in China. Vice-president Yee presided over the remaining Society meetings.

March and November were plant donation months.

Seven projects in the 1986 Hawaiian Science and Engineering Fair received awards from the Botanical Society. The Society has adopted an aggressive policy of supporting the fairs as one means of encouraging school teachers and students to work with plants. It is hoped that they will become interested in our native flora and participate in our efforts to save our island heritage.

Three Botanical Society Newsletters, Vol. 25, p. 1-120 were produced in 1986.

Speakers of the Month for 1986 were:

January- No meeting

February- Dr. Gerald Carr (University of Hawaii, Botany Department): "Everything you always wanted to know about silverswords but were afraid to ask because you knew he would go on, and on, and on."

March- Dr. Wayne Gagne (Education Department, Bishop Museum): "Feral pigs, wallows and digs: the impact of feral pigs on the Hawaiian environment."

April- Dr. Bill Magruder (Botany Department, Bishop Museum): "The sex life of a red alga."

May- Ms. Audrey Newman (The Nature Conservancy of Hawaii): "The Hawaii Heritage Program of the Nature Conservancy."

June- Ms. Faith Roelofs (Hawaii Nature Center): "It's science, isn't it?"

October- Mr. Ken Nagata (Lyon Arboretum): "Ethnobotany of Nepal."

November- Dr. Mark Merlin (University of Hawaii, General Science Department): "Plants of the Southern Cook Islands."

December- Mr. Rylan Yee (Botany Department, Bishop Museum): "Gardens in time - Bishop Museum's contribution to botanical education."

HAWAII'S ENDEMIC RUST FUNGI

Donald E. Gardner
CPSU/UH Botany Department
University of Hawaii at Manoa
Honolulu, Hawaii 96822

In his definitive publication of "Hawaiian Fungi" as a Bernice P. Bishop Museum Bulletin, F. L. Stevens attempted to list and annotate all native and non-native fungi known in Hawaii at that time (Stevens, 1925). Although this work has been updated considerably, "Hawaiian Fungi" remains the basic historic reference for mycological investigations in Hawaii.

Among the groups to which Stevens devoted particular attention were the rust fungi (Uredinales). Of this distinctive order of obligate parasites Stevens stated: "The scant number of rusts as compared with those to be found in the Continental sub-tropics or sub-tropical continental islands is striking." A table with numerical comparisons of rusts known in Hawaii with those of Puerto Rico, Indiana, and Wisconsin, regions with which Stevens was also familiar, was included to illustrate this conclusion. Stevens continued "...I believe...that the above comparisons are legitimate and that the conclusion is forced that the scarcity of rusts is due solely to the geographic isolation of the Hawaiian islands which lie more than 1,000 miles from any considerable land body" (Stevens, 1925).

Stevens also noted the scarcity of aecial spore stages among the rusts that were present in Hawaii, an observation that I have substantiated in my own more recent studies. Since the spermogonial-aecial host of heteroecious rusts is usually taxonomically unrelated to the uredinial-telial host, the occurrence of both hosts of introduced rusts in Hawaii would be coincidental. Most rust fungi may perpetuate themselves by reinfection with the uredinial, or repeating, stage, thus surviving indefinitely in the absence of an aecial host. To the extent that their life cycles are presently understood, no endemic rusts are known to be either heteroecious or macrocyclic.

Stevens listed each rust fungus according to its presumed endemic, indigenous, or recent introduction and the probable general world region of origin (i.e., American, western, Far Eastern). The rusts listed as endemic were as follows:

Puccinia oahuensis E. & E. on Syntherisma pruriens (Trin.) Arthur
Puccinia velata (E. & E.) Arth. on Euphorbia multiformis H. & A.
Pucciniastrum wikstroemiae Arth. on Wikstroemia uva-ursi Gray (akia)
Uredo hawaiiensis Arth. on Carex oahuensis C. A. Mey. ex Hbd.

Uredo stevensii Arth. on Euphorbia clusiaefolia H. & A.
Uromyces alyxiae Arth. on Alyxia olivaeformis Gaud. (maile)
Uromyces koae Arth. on Acacia koa Gray (koa)

An additional species, Puccinia polygoni-amphibii Pers., was designated endemic in Stevens' table but this species is well known elsewhere. This designation is probably a misprint, since in his annotation Stevens' understanding of the introduced status of this species is made clear (Stevens, 1925:123).

Of the original list, we have found the rust described as Uromyces koae [now Atelocauda koae (Arth.) Cumm. & Hirat. (Cummins and Hiratsuka, 1983)] to actually represent a complex of species, all occurring on endemic Acacia hosts. We redescribed Uromyces koae itself as a demicyclic species (Hodges and Gardner, 1984). Within this complex, a new genus of endocyclic rusts (a rare form in which the teliospore morphologically resembles an aeciospore), Endoraecium Hodges & Gardner, was described (Hodges and Gardner, 1984; Gardner and Hodges, 1985). We found another species, Atelocauda (=Uromyces) digitata (Wint.) Cumm. & Hirat., a rust formerly confused with A. koae and therefore not recognized by Stevens as a distinct species. Atelocauda digitata is known from Australia and New Zealand, although possibly in a demicyclic form. We consider A. digitata to be indigenous to Hawaii, where it occurs in both macrocyclic and microcyclic forms. The microcyclic form, in particular, is sufficiently distinct from the Australian form that this rust might be considered a separate, endemic Hawaiian species in future evaluations of these fungi (Hodges and Gardner, 1984).

Pucciniastrum wikstroemiae to my knowledge had not been reported since Stevens' observations, until I recently found this rust on Wikstroemia oahuensis (Gray) Rock in the Waianae Mountains. Critical examination of fresh material, and comparison with original herbarium specimens at the Arthur Herbarium of Purdue University have indicated this rust to be a species of Melampsora rather than Pucciniastrum. Furthermore, it resembles a Melampsora sp. reported on Wikstroemia hosts in Japan, Taiwan, and India. While this affinity is still under investigation, it is probable that P. wikstroemiae can no longer be considered an endemic rust.

Puccinia oahuensis, the only rust originally considered endemic occurring on a non-endemic host, more recently has been combined with species from other localities. According to the present, expanded concept of P. oahuensis, which is common on Digitaria spp. (crabgrass) in Hawaii, this species is circumglobal in distribution (Cummins, 1943).

Puccinia velata recently has been critically evaluated (Hennen and Hodges, 1981), with the conclusion that this species should be renamed Puccinia levata Hennen & Hodges and redescribed. Puccinia levata is currently considered to occur in Mexico as well as in Hawaii (Hennen and Hodges, 1981). It is interesting that even though Stevens apparently considered P. velata an endemic rust, he referred to Mexican material of this species (Stevens, 1925:124), leading to some confusion concerning his actual concept of this rust.

Hennen and Hodges (1981) also described Puccinia vitata Hennen & Hodges, a rust apparently overlooked by Stevens, as a new species on Euphorbia olowaluana Sherff var. gracilis (Rock) Sherff. Furthermore, these authors (1981) reexamined Uredo stevensii, of which only a single, meager herbarium specimen exists at Bishop Museum. However, I have examined this specimen and have found no reason to dispute its endemic status at present.

Like U. stevensii, Puccinia molokaiensis Cumm. on Carex sp. (Cummins, 1937) is apparently rare and is known only from herbarium material. This rust must also have escaped Stevens' knowledge. The possibility exists that critical reexamination of fresh material, if such can be found, will lead to redefinition of these species in the future. It is unfortunate that the host species of Carex for P. molokaiensis appears not to have been determined (Cummins, 1937).

As is indicated by the foregoing, the rust fungi of Hawaii, and endemic rusts in particular, had not received critical attention as a group since Stevens' time until my own investigations, some of which were conducted in collaboration with Dr. Charles S. Hodges of the USDA Forest Service. Dr. Joe F. Hennen, of the Arthur Herbarium of Rust Fungi at Purdue University, has also contributed. As a result of these investigations, the following nine rust species are currently recognized as endemic to Hawaii:

Atelocauda koae on Acacia koa var. koa and A. koa var. latifolia (Benth.) St. John
Endoraecium acaciae Hodges & Gardner on Acacia koa var. koa and A. koaia Hbd.
Endoraecium hawaiiense Hodges & Gardner on Acacia koa var. koa and A. koa var. waianaiensis St. John
Puccinia molokaiensis
Puccinia vitata
Uredo hawaiiensis on Carex wahuensis C. A. Mey.
Uredo stevensii
Uromyces alyxiae
A new, still undescribed rust on Coprosma rhyncocarpa

It is notable that of the nine currently recognized endemic rusts, three are closely related species on endemic Acacia hosts. These, together with the macro- and microcyclic variants of Atelocauda digitata, also Acacia rusts, appear to be in a state of adaptive radiation, with A. digitata from Australia or New Zealand considered to be the original colonizing species. This may be the first example of adaptive radiation recognized among the fungi in Hawaii.

Recently I have conducted a study to determine teliospore germination characteristics and elucidate the life cycle of _Uromyces alyxiae_. Although I was unable to demonstrate reinfection of maile, for the present _U. alyxiae_ is considered a microcyclic rust with a single spore stage (Gardner, in press). I have also collected fresh material of _Uredo hawaiiensis_ and reaffirmed the validity of this species. Investigation of the _Coprosma_ rust is currently in progress; however, there is little present doubt that it is endemic.

I do not wish to imply by listing the known endemic rusts of Hawaii that the list is considered complete. The small number of species may well reflect, at least to some degree, the lack of attention given by naturalists to native microorganisms, including fungi, relative to that devoted to higher plants and birds. Our recent (1986) discovery of the rust on _Coprosma_ illustrates this point. This rust was found on trees adjacent to the Kipuka Puaulu (Bird Park) trail, perhaps the most frequently used nature trail in Hawaii Volcanoes National Park. Although I have been able to readily observe (and collect) the rust without leaving the trail, it had been apparently overlooked previously. Future additions to the endemic rust flora therefore appear likely.

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RECENT FINDS FROM O'AHU

John K. Obata
1337 Ala Aolani
HONOLULU HI 96819

Ken Nagata and Sam Gon III have described a new species, Sanicula mariversa nom. prov., from ʻŌhikilolo. Two populations totaling about seventy plants are known, one from ʻŌhikilolo and the other from Ke'eau-Mākaha ridge. The former population has been known since 1972, but not in flower until 1986 by K. Nagata, S. Gon III and J. Lau. S. Perlman found the Ke'eau population.

A population of Hibiscus brackenridgei was recently observed by S. Perlman and J. Obata on a steep, dry slope in the northern Wai'anae Range. About thirty plants were noted, most were juveniles. Some plants were in bloom earlier in the year with a generous production of seeds.

The only known plant of Solanum sandwicense from in the southern Wai'anae Range was found recently by Steve Perlman. It was a small prostrate tree in prolific bloom and fruit. Seeds were collected by S. Perlman and J. Obata and vouchered.

The only "naturally growing" population of Hibiscus kokio was observed along the dry slope of northern Wai'anae Range by S. Perlman and J. Obata. The trees were in flower. Cuttings were taken previously by Jimmy Pang.

The genus Silene in unknown from O'ahu. Recently S. Perlman and J. Obata observed and vouchered a new species from a cliff face in southern, windward Wai'anae Range. This population is highly restricted to a vertical cliff face. Fifteen plants are known. The name S. perlmanii is being proposed.

In the same habitat as above, Pantago princeps var. anomala was observed and vouchered. One plant measured 1.5m. in height. These plants resembled a na'ena'e (Dubautia). Plantago princeps has not been seen on O'ahu in recent years. They are inhabitants of mid-level mesic dry forests.

Besides the one noted in Wai'alae Nui, a healthy tree (10 m. high) of Nesoluma polynesicum (Keahi) was observed in Manuwai Gulch (Mokulē'ia Forest Reserve) by S. Perlman and J. Obata and another in Nānākuli by S. Perlman and J. Lau. Keahi is almost unknown on O'ahu.

Several people have known of the existence of one plant of Gardenia brighamii (Nānū) from southern, windward Wai'anae Range for about half a century. Recently S. Perlman and J. Lau observed and vouchered two plants from the leeward, southern Wai'anae Range. One plant was "loaded" with fruits and flowers.

SPONTANEOUS SPREAD OF ANGIOPTERIS EVECTA (MARATTIALES) IN THE CENTRAL KO'OLAU MOUNTAINS, O'AHU, HAWAI'I

Evangeline Funk
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
HONOLULU, HI 96822

Hawaii and Florida have far more naturalized fern species than any other state (pers. comm. H. W. Wagner). However, the introduced Hawaiian species are much prolific than those in Florida, many having spread above roadsides and trails and become very abundant (Wagner 1950, 1972). Among the most numerous naturalized ferns in Hawaii are members of the genera Adiantium, Blechnum, and Thelypteris. Often we can estimate the time of arrival and the rate of spread of a species. For example, Skottsberg (1942) reported a collection in 1938 of Athyrium japonicum (Thunb.) Copel. from the Kohala Mountains on the island of Hawaii. In the half century since, this species has spread to all the islands and is now abundant in many localities.

Angiopteris evecta (Forst.) Hoffm., the mule's foot or giant fern, was introduced into Hawaii by Dr. Harold Lyon of the Hawaiian Sugar Planters Association in 1927. The fern was planted along 'Aihualama Stream in what is now the Lyon Arboretum in Mānoa Valley above Honolulu. This location, at about 170 m elevation, is just inland from the University of Hawai'i, and is in one of the amphitheater- headed valleys so common in the islands. To meteorologists these valleys are of interest because of the chaotic wind conditions that are known to develop within them, especially during winter "kona" storms.

Angiopteris evecta is a spectacular fern. In Lyon Arboretum it develops fronds of more than 7 m in length, bearing millions of spores. The individual spores have miniscule weight and are readily transported by wind. Even after sixty years, Angiopteris has not spread far, but it is now positioned to make headway into new localities. By 1950, the plant had become a pest within the Arboretum and large numbers of individuals have been eradicated. In 1964, a new population was discovered atop Mount Olympus, an 800 m peak east of Mānoa Valley, which is part of the Ko' olau Range that separates the windward and leeward sides of the island of O'ahu. The location of this new population is very important because from this vantage point, in the path of the Northeast trade winds and the chaotic winter winds, propagules of Angiopteris can be dispersed to both sides of the central range. That is exactly what has happened. In 1965, Angiopteris was found growing in the Pālolo Valley watershed. This site is separated from Mānoa Valley by a 500 m high ridge, but is down slope from the Mount Olympus population. In 1968 a population was found along Mānoa Cliffs Trail above Honolulu. And in 1987, a fourth population was found on Lanihuli Peak. This site is two and one half miles from the original planting, but is separated from it by two valleys and three ridges. A fifth, unconfirmed population has been reported from the Maunawili Valley of windward O'ahu. The range now occupied by Angiopteris on O'ahu clearly indicates its dispersal by wind and it may soon fill many of the niches formerly occupied by endemic Hawaiian ferns and other plants.

One plant was recently seen along the Hāna Highway in East Maui, west of Hanawī (pers. comm. R. Hobdy, Maui Forestry). It is not known whether anyone is growing this species there. It seems likely, in view of what we have reported here, and in view of the success of other invaders, that his enormous fern will continue its migration through the islands. Although it is a most interesting plant for its monstrous size and various botanical features, it, like some 20 other ferns that have become naturalized in Hawai'i, may ultimately become a pest.

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CONFERENCE ANNOUNCEMENT - HYDROPONIC SOCIETY OF AMERICA

The Hydroponic Society of America will hold its Ninth Annual Conference and Trade Show at the Clarion - San Francisco Airport Hotel, in California, on April 22, 23 and 24, 1988.

The keynote speaker will be Dr. Merle Jensen from the University of Arizona's Environmental Research Laboratory. Concurrent sessions will address a variety of topics relating to hydroponics, including: management of nutrient solutions, hydroponic production of different species of plants, control of nutient solution-borne plant diseases, and the use of automation in large scale commercial hydroponic operations.

For additional information and registration applications, please contact Mr. Gene Brisbon, Executive Director, P.O. Box 6067, Concord, CA 94524, or call 415-682-4193.

THERE ARE ALIENS AMONG THE ALGAE, TOO--OR LIMU MALIHINI

Isabella A. Abbott
Dept. of Botany, UH, Manoa
3190 Maile Way
Honolulu, HI 96822

This past summer, many residents of Kūau, a coastal section just southeast of Pā'ia, Maui Island, were up in arms over the appearance of masses of a "new" seaweed on their beaches. Indeed, the culprit alga was new to Maui, having come over from O'ahu Island where it had been spreading since its introduction to Kāne'ohe Bay about 1974. The red alga alien is Hypnea musciformis which is common in the Caribbean and in the warm Atlantic (carried by the Gulf Stream). Stories about its introduction are not agreed to by all parties, one saying that it was deliberately introduced, another saying that it was accidental, having come with another species of algae as an epiphyte from the Caribbean. I began to record its spread in the Fall of 1978 when I found it at Ka'a'awa (not far from the mouth of Kāne'ohe Bay), and in the Fall of 1979 it was at Lā'ie Point; in 1980 at Waikīkī; 1981 at 'Ewa Beach and by 1982 when I moved here and was able to get out more often it seemed to have reached every nook and cranny of intertidal O'ahu. Although principally an epiphyte, and ideally suited for that mode of existence due to large hooks that are modified tips of branches, H. musciformis also occurs on rock. It makes up between 1/3 to 1/2 of the wet biomass of most drift piles on the beaches, and it is my (unscientific) opinion that it accounts for larger masses than previously of Sargassum on the beaches, since it adds drag and weight to the Sargassum plants. Sargassum was frequently in the drift in late Summer and Fall in pre-Hypnea times.

When Hypnea musciformis was introduced to Hawai'i, it was thought to be a good source of kappa carrageenan, a useful colloid usually obtained from species of Eucheuma, red algae that grow naturally in the Philippines where the bulk of kappa carrageenan "weed" comes from. However, because of its delicate thallus, barely 0.5 to 1.0 mm diam., it is difficult to process ("clean") for colloid extraction (commercial Eucheuma species, by contrast are frequently 4.0 mm or more in diameter).

I seriously suggested to the Maui folks that they cook with Hypnea, extracting the gelatin-like colloid and using it in molded salads, or desserts like yokan, or use it as a fertilizer in their gardens. Do anything to get it off the beaches so as to short-circuit the life history. Haven't heard what happened since. Hypnea musciformis has turned out to be a worse pest than the earlier introduced Acanthophora spicifera which was noticed some time after World War II years (Doty 1961).

There was a short period during the 1970s when it was thought desirable to investigate potential domestic sources of colloid-producing algae (Abbott 1980) since overseas operations frequently had a boom-and-bust nature, or governments were unstable, and because the demand for colloids frequently exceeded the supply by 10-20 times (Doty 1973). It was in this period that Hypnea musciformis was brought to Hawaii without a permit.

In this period, also, Dr. M. S. Doty of the Botany department, University of Hawaii at Manoa, brought a species of Eucheuma to Hawai'i under permit for experimental work in Kāne'ohe Bay. As is common with many newly introduced plants, there was a very large "bloom" of this very conspicuous species, some plants being more than a meter high, with thick branches up to 5 or more mm diameter. It was quickly named "The Green Blob" and a lot of energy was spent both in trying to get rid of it near Hawaii Institute of Marine Biology, and talking about it. Dr. Doty said at the time that as soon as the plants went over the reef edge into deeper water, they would be killed since they could not photosynthesize at depth. This had turned out to be the case. Nowadays it has seemed to establish itself in small pockets in Kāneohe Bay, and has not in my experience at least, left the Bay. This species is called "giant ogo" and is available for sale at Tamashiro Market in Kalihi most days. (It makes a fairly good pickle in the Japanese style "namasu", and is outstanding in a spice cake).

Several other seaweeds have been brought to Hawai' i in the past few years under permit. Included is Macrocystis pyrifera, the so-called "Giant Kelp" which is the food of choice for the abalone that are being grown under aquaculture conditions near Keāhole Point. The reason this species can be grown at Keāhole Point is because of the cold water which is brought up from depth, and is thought to be controlled from spreading because surface sea water temperatures are too warm for the kelp to complete its life history. However, occasionally small sporophytes (the spore-bearing kelp plant) may be seen and have been a source of concern to Dr. E. Alison Kay, who is a member of an advisory committee for the State Department of Land and Natural Resources. The advice of this committee is sought when applications are made for importation of plants or animals. Without living near Keāhole Point and being able to monitor the status or progress of such alien plants, I could only predict, out of experience in California, that the plants would die before they reached spore production. (Such plants have been physically removed before such stages were reached, so the value of the prediction will never be known).

At about the same time, a species of Porphyra (nori) was brought in under permit from Japan, again with the understanding that its life history could not be easily completed in surface sea water temperature, and this has proven to be the case.

The most recent seaweed introduction under permit is Gracilaria tikvahiae from Florida, imported to grow under aquacultural conditions because the "natural" species in Hawaii (G. parvispora, also erroneously known as G. bursa-pastoris, a species that does not occur in Hawaii) has a normal low growth period in the winter. Under some protest from the advisory committee, this species was introduced, and subsequently has escaped into the intertidal. Whether or not it will spread is too soon to say. It is enjoying a commercial success as "ogo" (locally the favorite seaweed to be eaten with raw fish). If it becomes widely distributed, people will harvest it for their own food supply, and so partly control its spread, but as a phycologist, I have no idea (as no one does) how it might live with the seaweeds that are already here. The best thing that can be said for it at this time is that it cannot vegetatively propagate itself by using hooks that Hypnea musciformis has.

Recently, an application to import several species of agar-producing seaweeds was made with the Department of Agriculture. At their urging, I was encouraged to file a negative evaluation of the request, and so strongly suggested that a few experiments that might include sea water temperature tolerance and other physical tests be made before applications were approved. At the same time, I encouraged the applicant to experiment with local species in the same genera before seeking alien species. I was pleased that my recommendations were sent to the applicant, who agreed to hold off until more investigations on local species had been made.

There may be other species of seaweeds introduced to Hawaiian waters without anyone's knowledge, just as there appear to be flowering plants that are introduced as seeds. Many culinary herbs, for example, are found in some of the ethnic stores in Honolulu for which there are not specimens in the Bishop Museum herbarium; some of them are frequently used for their leaves alone so no fertile portions are obtained and it becomes difficult to identify them. We know nothing, or very little about their habits, their growth patterns, their competitive abilities and, like the dozens of ornamental plants that are introduced each year to Hawaii, we have no idea what they will do to the "permanent party". How many will become the pestiferous "java plum", Lantana camara, "banana poka", "Koster's curse", or even Wedelia which is now at the top of Mount Ka'ala?

Some day, perhaps sooner than we know, it may be impossible to do a baseline study of a shallow subtidal bottom with a "normal" seaweed flora. Both Hypnea musciformis and Acanthophora are now so widespread and abundant that one cannot help but wonder "what species were there before these came?" I would liken the occurrence of Convolvulus arvensis (field bindweed, introduced before 1927, according to St. John, 1973) and Pluchea indica, introduced before 1922 (St. John, 1973) to these two seaweed aliens, in habit as well as abundance and distribution.

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CONFERENCE ANNOUNCEMENT

RESTORING THE EARTH 1988 - The first national gathering to consider the restoration of all natural resource types and the redesign of urban areas will be held on January 13-16 at the University of California, Berkeley. The conference is organized by the Restoring the Earth project of The Tides Foundation, San Francisco, and cosponsored both by the College of Natural Resources and the Center for Environmental Design Research of the University of California, Berkeley. It will bring experts in natural resource restoration and management together with a broad selection of academic, government, industry, foundation, labor, public health, and environmental representatives. Participants will help create new solutions to the nation's environmental problems, through restoration of damaged resources.

Topics to be covered include restoration of coastal ecosystems and estuaries; rivers and lakes; streams and fisheries; rangelands, prairies, mined lands, forests and wildlife; atmosphere and climate; dry lands and agricultural lands; urban environmental planning; and control of toxic wastes. Formal refereed papers will be presented at scientific and technical sessions. Non-technical sessions will include accounts of restoration successes and discussions of policy issues, legislation, litigation, trends, and resource conflict resolution. The program also includes keynote panels, plenary sessions, workshops, films, and exhibits.

Information is available from: Restoring the Earth Conference, 1713 C Martin Luther King Jr. Way, Berkeley, CA 94709, or telephone (415) 843-2645.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1986

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NOTES ON RECENT FERN COLLECTIONS AND OBSERVATIONS IN HAWAI'I VOLCANOES NATIONAL PARK, HAWAI'I AND KĪPAHULU VALLEY HALEAKALĀ NATIONAL PARK, MAUI

Paul K. Higashino
Hawaii Volcanoes National Park
Hawaii 96718

In the past few years personnel from the Research Division Hawaii Volcanoes National Park (HAVO) have made several new and noteworthy fern and fern allies collections and observations both at HAVO and in Kīpahulu Valley, Haleakalā National Park (KIPA). Many of these ferns have been collected in relatively newly acquired lands or areas infrequently traversed by biologists. These areas include: 'Ōla'a Tract (under Park Service jurisdiction since 1960) and Kīpahulu Valley (given to the Park Service in 1969, by the State of Hawai'i and The Nature Conservancy.). Both native (indigenous and endemic) and alien taxa have been noted. Since Herat and Herat's (1975) study an additonal ten pteridophyte taxa have been found in HAVO. Many of these new records were from 'Ōla'a Tract (Jacobi and Warshauer 1975).

Special management action should be taken against the alien ferns. One, Cyathea australis needs to be eradicated as soon as possible. Five alien ferns have appeared in KIPA since 1967 (Lamoureux 1967), and eight in HAVO since 1975 (Herat and Herat 1975). The distribution and spread of some of these ferns throughout the Islands is increasing and their full impact on native ecosystems has not been fully evaluated.

The ferns are listed alphabetically by family (as recognized by Pichi-Sermoli (1977). Voucher specimens are on deposit at B.P. Bishop Museum and/or HAVO herberia.

ASPIDIACEAE

Dryopteris crinalis (Hook. & Arn.) C. Chr. Endemic
KIPA in shaded and moist gulches at higher elevations.

ATHYRIACEAE

Athyriopsis japonica (Thunb.) Ching Alien
This fern can be found growing in rainforest of 'Öla'a Tract, East Rift Zone, HAVO and KIPA from 500-4800 ft. First reported from HAVO in 198_ and KIPA in 1980.

Athyrium marginale (Hillab.) Copel. Endemic
Growing in dry stream bed in KIPA. First record for the valley.

Diplazium esculentum (Retz.) Sw. Alien
=(Athyrium esculentum (Retz) Copel.)
In low numbers in the East Rift Zone of HAVO. Some of these areas may have been covered by recent lava flows from the Pu'u O Series.

BLECHNACEAE

Blechnum occidentale L. Alien
East Rift Zone of HAVO in low numbers. First observed in KIPA in 1980 at 3100 ft. on a U.S. Fish and Wildlife Service Hawaii Forest Bird Transect.

Sadleria souleyatiana (Gaud.) Moore Endemic
Many plants found in the 'Ōla'a Tract HAVO with trunks up to 12 feet tall.

CYATHEACEAE

Cyathea ?australis (R. Brown) Copel. Alien
Found growing on the lower level of Dog-leg at KIPA. Only one plant seen. Growing with Athyrium sp.

ELAPHOGLOSSACEAE

Elaphoglossum pellucidum Gaud. Endemic
A few plants have been found in 'Ōla'a Tract and the east rift zone HAVO.

GRAMMITIDACEAE

Adenophorus periens Bishop Endemic
A category 1 plant on the U.S. Department of Interior. (1985). Large populations found in Kahauale'a adjacent to HAVO. Several populations have been located in the Nāpau Crater area, Kānenuiohamo and in 'Ōla'a Tract HAVO.

HYMENOPHYLLACEAE

Gonocormus prolifer (Blume) Prantl Indigenous
Several collections in both the small and large Tracts of 'Ōla'a, HAVO. Also found in KIPA above ft. Usually growing epiphytically on trunks of Metrosideros and Cheirodendron. This fern can easily be overlooked because of its small size and its resemblance to other hymenophyllaceous ferns.

Vandenboschia draytoniana (Brack.) Copel. Endemic
Growing in Ilex anomala in 'Ōla'a Tract, HAVO. New to the park.

SELAGINELLACEAE

Selaginella kraussiana (Kunze) A. Brown Alien
First collected in HAVO on lawns in the residential area by G.E. Olson on Dec. 12, 1938. One collection from O'ahu by T. Herat #271 Aug. 26, 1972 on the Waiāhole ditch trail. Several collections and observations have been made since that time in the forests by Thurston Lava Tube and in a jeep pull-out in the Pu'u Maka'ala area.

SINOPTERIDACEAE

Pellaeae ternifolia (Cav.) Link Indigenous
Many plants are resprouting after the September 1987 Uila fire. Shoots 10-15 cm in burned one and one half months after fire.

THELYPTERIDACEAE

Macrothelypteris torresiana (Gaud.) Ching Alien
Found in low numbers only in 'Ōla'a Tract and Puhimau HAVO. In the lower Puna District it can be found in moist lowland forests and occasionally as a pioneer in cracks on lava flows.

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REPORT OF THE PROGRAM CHAIRMAN (VICE-PRESIDENT) FOR 1987

We has nine meeting in the year, featuring the following speakers, all of whom I wish to thank again: Drs. Charles H. Lamoureux, Seymour Sohmer, Warren H. Wagner, Jr., Barry Funkhauser, Haruyuki Kamemoto, Wallace Mitchell, Sheila Conant and Dan Palmer, and Mr. Alan Holt. Among those who participated in "show and tell" or "Plant of the Month" were: Drs. Florence Wagner, Haruyuki Kamemoto and Isabella Abbott, and Messrs. Clyde Inaba, Steve Perlman and Ray Fox.

This year, the officers as well Don Gowing (twice), John Obata and Elizabeth Anderson brought refreshments. We did not do as well with diversity as when Ms. Zella Ellshof brought refreshments, but we had taken advantage of her. Considering everything, the refreshments worked out fine this way, but we will be asking for volunteers from among the membership. Please help--being able to talk things over, with a cookie and a fruit drink in hand, is something many of us look forward to!

Isabella A. Abbott

BOOK REVIEW

Plants and Flowers of Hawai'i, S. H. Sohmer and R. Gustafson, University of Hawaii Press, 1987, 160 --. Price $14.95.

This book represents a magnificent addition to the growing collection of photoessays on the Hawaiian Flora. The quality of the photographs and their reproduction are superior to any comparable work. About 180 brilliant color photographs illustrate over 140 native species, 10 introduced species and a variety of Hawaiian habitats. The text includes short sections on the history of botany in Hawai'i, the biology and derivation of the flora, evolution of species and landscapes, and vegetation zones. An index to scientific names and a brief bibliography are also provided. The text could have benefited from additional editing as it lacks the crystal clarity found in most of the photographs. Moreover, the discussion on floral biology, including two paragraphs misplaced in the section on hybridization, is not very precise. In particular, few botanists are likely to agree with the definition and discussion provided for monoecy. Happily, the captions in the "Plants and Flowers" portion of the book appear to be virtually error free and provide Hawaiian, scientific, and family names, as well as brief descriptive notes and information on the distribution of each plant illustrated. The species are grouped according to habitat. Botanists familiar with the Hawaiian flora may note some unfamiliar plant names. This is because the authors have followed the nomenclature developed for a forthcoming manual of Hawaiian plants that is being compiled and written at the Bishop Museum All things considered, I find it inconceivable that anyone even remotely interested in Hawaiian plants would pass up this beautiful book. Given the outrageous price of most books these days, this one is a steal.

Gerald D. Carr
Department of Botany
University of Hawaii at Manoa

HAWAIIAN BOTANICAL SOCIETY
Minutes of the January, 1987 Meeting

President Yee called the meeting to order at 7:35 p.m. The minutes of the December meeting were read and approved. The treasurer reported that the balance as of January 1, 1987 was $3299.48.

The membership chairman reported the acceptance of one new member to the Society, Mr. George Levitt.

The Newsletter chairman reported that one article had been received from Randall Mew on the cultivation of strand plants for the next issue of the Newsletter.

Under old business, there was some discussion on the proposed amendment to increase the life membership dues from $100 to $150 in 1987. The amendment was passed unanimously.

Bill Bush reported that he had audited the Society books and found them in excellent order.

President Yee thanked Zella Ellshoff for the excellent job she has done in preparing the refreshments for the meetings for the past few years and announced that for the 1987 meetings members are asked to volunteer to take care of refreshments. A sign up sheet will be available after the meeting.

Plant of the Month speaker was Mr. Clyde Imada of the Botany Department, Bishop Museum who demonstrated how to mount herbarium specimens.

Speaker of the Month was Dr. Charles Lamoureux, Botany Department, University of Hawaii, whose talk was entitled "Botanical Experiences in Indonesia".

The meeting was adjourned at 9 p.m. and members then enjoyed refreshments.

Respectfully submitted,
Christa Russell

HAWAIIAN BOTANICAL SOCIETY
Minutes of the February, 1987 Meeting

President Yee called the meeting to order at 7:30 p.m. The minutes of the January meeting were read and approved. The treasurer reported that the balance as of February 1, 1987 was $3504.94.

Mr. Steve Perlman was nominated and accepted as a new member of the Society.

There was no old business.

Under new business President Yee reported that Waimea Arboretum Foundation asked the Society to support their education program with a $250 grant. The Society members voted their approval that the members of the board of the Marie Neal Fund consider the grant request.

Also, under new business President Yee proposed the establishment of two new Society committees. The present committees are membership, audit, conservation, native plant, and the newsletter committee. The two proposed committees are [general] botany and a horticultural committee. The committee chairpeople would report on any new or interesting developments relevant to their area of interest at the monthly Society meetings, and would contribute articles for the Society newsletter. Volunteers to chair these committees were being sought.

Vice-president Abbott introduced the Plant of the Month speaker, Dr. Don Gardner of the National Park Service and the Botany Department, University of Hawaii, who spoke on fungi infections on Hawaiian Vaccinia. Speaker of the Month, Dr. Sy Sohmer, chairman of the Bishop Museum's Botany Department, spoke on his botanical excursions in Papua New Guinea, one of botany's last frontiers.

The meeting was adjourned at 9:00 p.m. and members then enjoyed refreshments.

Respectfully submitted,
Christa Russell

HAWAIIAN BOTANICAL SOCIETY
Minutes of the March, 1987 Meeting

President Yee called the meeting to order at 7:30 p.m. The minutes of the last meeting were read and approved. The treasurer reported that the balance brought forward was $3510.68.

The membership committee chairman reported that dues had been received from Paul Higashino and Bill Kramer, and that John Plews was a new life member.

Under old business President Yee announced that the trustees for the Marie Neal Fund had approved the new name, Neal-Miller Fund. Also, the trustees had decided they would appoint a committee to decide on the criteria necessary for grant proposals, and they were considering various ways of investing the money in the Fund.

For new business, President Yee announced that, beginning in April, Society members must provide refreshments as this was the last meeting the executive board would provide them. A sign up sheet would be available at the end of the meeting.

Pseudophagopteris caroliniana was the subject of Dr. Florence Wagner's (University of Michigan) plant of the month presentation. This fern doesn't really climb but "leans" on other plants. Individual plants may reach 7 m. in length.

Dr. Warren H. Wagner, Jr., (University of Michigan) speaker of the month, presented an interesting and informative talk on "Problems in Hawaiian Ferns".

The meeting was adjourned at 9 p.m. and members then enjoyed refreshments.

Respectfully submitted,
Christa Russell

HAWAIIAN BOTANICAL SOCIETY
Minutes of the April 6, 1987 Meeting

President Yee called the meeting to order at 7:30 p.m. The minutes of the March 2 meeting were read and approved. The Treasurer reported the balance as of April 6 to be $4011.31.

The Membership committee proposed, and the Society approved, membership for Maria Leu. Dr. Max Doty became a Life Member.

There was no old business.

Under new business, in connection with the Science Fair the President noted that the Society was awarding three cash prizes of $50 each and books to the botanical exhibits. If the exhibit was horticultural, the book would be Marie Neal's In Gardens of Hawaii, and if non-horticultural it would be Sherman Carlquist's Island Life.

Further, it was time to renew signature authority for disbursements from the Neal-Miller Fund. Apparently, Society approval in required, and approval was voted.

President Yee announced a symposium for 25 April jointly sponsored by the World Wildlife Fund and the Garden Clubs of America. The topic was to be on the Roots of Life and Futures in the Wild.

The Plant-of-the-Month speaker was Dr. Horace F. Clay, Botany Department of the Bishop Museum, who described a dwarf variant of the mock orange, Murraya exotica = Murraya paniculata, which has turned up in his own plantings of seed and also in one or more nursery plantings. He noted that although this species grows as a shade tree or as a hedge, this new entity grows from one to 15 inches in height, and may set a single flower and fruit at one inch! It has not yet been named as a cultivar, but of its seeds, about 80% are dwarfs.

Dr. Barry Fankhauser, Chemistry Department, University of Hawaii, then spoke on Prehistoric Use of the Ti Plant in New Zealand. Cordyline australis (Cabbage Tree) is a tree in New Zealand, and common in the Dunedin area of South Island. The cabbage tree was a major source of food in ancient times, apparently, as evidenced by the abundant remains of cooking pits, "Omo ti", in the region. Other species were used, including C. terminalis, but were less important. The roots are the equivalent of the sweet potato and taro in carbohydrate content, but are rather more difficult to dig out and prepare. The plant has been used in many ways other than food, throughout Oceania, up into recent times. Dr. Fankauser used both C-14 and chemoluminescence techinques to date the usage of most of the omo ti to the period from 600 to 1200 years ago.

The meeting adjourned for refreshments at about 9:15 p.m.

Respectfully submitted,
Donald P. Gowing, for
Christa Russell, Secretary.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the May, 1987 Meeting

President Yee called the meeting to order at 7:30 p.m. The minutes of the April meeting were read and approved. The treasurer reported that the balance brought forward was $3810.22.

The membership committee chairman reported that dues had been received from June Katmanus and David Fisher.

The results of this years Science Fair were announced. The judges representing the Society were Bill Brostoff, Rylan Yee, and Clyde Imada. The Best of Show went to Jane Yashiro, grade 8, for her project entitled "Can Gracilaria bursapatoris grow in artificial salt water?". Best Senior project was awarded to Steve Howell, grade 10, Castle High School, for his project "Mathematical relations in botanical vascular structures." Best junior project was awarded to Emily Bordner, grade 7, Punahou, for her project "Vegetation along Waialae Nui."

Under old business, Marie Brugemann announced that a management agreement with the City and County of Honolulu had been approved for the Marsilea villosa population at Ihiihilauakea. Marie will be working on the management plan and welcomes input from interested Society members.

Volunteers will be needed to erect a barrier against off-road vehicles, weed control, and to periodically monitor the barrier. The barrier will be erected in September with materials provided by the City and County of Honolulu. Marie will oversee the initial planning and Dan Palmer will oversee the execution on the plan in September.

There was no plant of the month speaker.

Dr. Haruyuki Kamemoto, recently retired from the Horticulture Department, University of Hawaii presented a very interesting and beautifully illustrated talk on "Development of new Anthurium and Dendrobium cultivars". Dr. Kamemoto brought in many colorful examples of the anthuriums and dendrobriums which have been developed in his laboratory.

The meeting was adjourned at 9:00 p.m. and members then enjoyed refreshments.

Respectfully submitted,
Christa Russell

HAWAIIAN BOTANICAL SOCIETY
Minutes of the October, 1987 Meeting

President Yee called the meeting to order at 7:35 p.m. The minutes of the June meeting were not read as the Secretary had misplaced them. There was no treasurer's report.

The membership chairman reported the acceptance of three new members to the Society, Mrs. S. Cooke (Garden Club of Honolulu), Donald Drake and Karen Shigematsu.

Under old business, Marie Bruegmann called for volunteers to help erect signs and barriers, and to help with weed control for the Marsilea villosa colony at Koko Head. Under an agreement with The City and County of Honolulu and The Nature Conservancy of Hawaii, the City will provide the materials while the Botanical Society will provide the labor. Nine members have volunteered to help with this project.

Under new business, President Yee announced that elections for new officers of the Society will be held in December. Volunteers were needed for the nominating committee.

Also under new business, Steve Montgomery announced that a citizen's group on Lāna'i wishes to expand the fence system around the Kānepu'u dryland forest. The landowners, Castle & Cooke, wanted to know if scientific organizations supported this idea. A motion was proposed and approved that the Botanical Society send a letter supporting the fenceline proposal.

The plant of the month speaker was Mr. Steve Perlman who spoke on his recent plant discoveries in the Hawaiian Islands.

Speaker of the Month was Dr. Sheila Conant, General Science Department, University of Hawaii, who spoke on Biological Observations in the Northwest Hawaiian Islands.

The meeting was adjourned at 9 p.m. and members then enjoyed refreshments.

Respectfully submitted,
Christa Russell

HAWAIIAN BOTANICAL SOCIETY
Minutes of the November, 1987 Meeting

President Yee called the meeting to order at 7:30 p.m. The minutes of the October meeting were read and approved. The treasurer reported that the balance brought forward was $3846.55.

Under old business, president Yee announced the proposed slate of officers for 1988:

President:	[undetermined at the time]
Vice-President:	Mr. Steve Perlman
Secretary:	Ms. Maria Leu
Treasurer:	Dr. Derral Herbst
Directors:	Dr. Isabelle Abbott
	Dr. Lyndon Wester

Elections will be held during the December meeting.

Under new business, a motion was proposed and approved for the Hawaiian Botanical Society to request $1000.00 from the Neal-Miller fund for The Nature Conservancy's drive to purchase land at Mo'omomi beach on Moloka'i.

Dr. St. John announced that the Watmull Foundation has published his biography and members may order copies from him (they are not available in bookstores).

Also under new business, a citizens group from Lāna'i, Hui Malama Pono o Lāna'i, asked the Society to write a letter of support for their proposal to Castle & Cooke for fencing of 30 acres of the Kānepu'u native dryland forest. A motion was proposed and approved, and the secretary drafted a letter of support from the Hawaiian Botanical Society. The Society also approved a motion to send a donation towards fencing materials and/or labor if Hui Malama Pono o Lāna'i requests it.

Plant of the month speaker was Dr. Abbott who spoke on Lyngbya majuscula, a blue-green alga which causes a contact dermatitis called "swimmers itch" and Grevillea banksii, which was introduced to Hawaii in 1917 and is now considered a noxious weed.

Speaker of the month was Dr. Dan Palmer whose interesting and informative talk was entitled "Skin reactions of plants in Hawaii: patterns and mechanisms." Some of the skin reactions caused by plants include hair loss (koa haole and sensitive plant), "white spot disease" (yeast) and acute and delayed allergies.

The meeting was adjourned at 9 p.m. and members then enjoyed refreshments.

Respectfully submitted,
Christa Russell

HAWAIIAN BOTANICAL SOCIETY
Minutes of the December 1987 Meeting

Vice-President Abbott, standing in for the President, called the meeting to order at 7:30 p.m. The minutes of the November meeting were read and approved. The Treasurer reported that the balance brought forward was $3822.07.

Under old business, Vice-President Abbott conducted the election of 1988 Society Officers. Nominations from the floor were made and the proposed slate was unanimously elected.

President:	Dr. Lyndon Wester
Vice-President:	Mr. Steve Perlman
Secretary:	Ms. Maria Leu
Treasurer:	Dr. Derral Herbst
Directors:	Dr. Isabella Abbott Mr. Rylan Yee

Ms. Marie Bruegmann was looking for 6-10 volunteers to help construct protective barriers at Koko Head January 9-10 for the Marsilea population. She was also seeking an interested person to assist in conducting controlled herbicide tests on Marsilea in hopes of eradicating invading grasses.

Under new business, a Get Well card was sent around to be signed by members for Dr. Don Gowing, who was injured in an accident recently and is currently at Queens Medical Center.

Mr. Steve Montgomery called attention to the re-authorization vote on the Endangered Species Act on December 10. Some States are lobbying to add amendments that would weaken the Act. He urged members to offer support to the Congressmen who are not backing the addition of the restrictive amendments.

Mr. Montgomery also reported that an accusation was made by local businessmen that the Deep Draft Harbor project is being delayed because of the presence of an endangered plant species. Mrs. Winona Char indicated that she had finished her botanical part of the associated project about a year ago and suggested it was more likely a bureaucratic delay. Mr. Montgomery and Ms. Char will draft a letter from the Society responding to these accusations.

Plant of the Month speaker was Mr. Ray Fox who talked about Hawaiian mushrooms. He brought several interesting specimens and spoke on edible vs. poisonous varieties.

Speaker of the Month was Mr. Alan Holt whose presentation was entitled "Molokai as a Conservation Center of the Pacific." He showed some beautiful slides of current Preserves and areas The Nature Conservancy hopes to purchase in the future. He also talked about how the Conservancy is educating the residents of Moloka'i regarding the purpose of the Preserves and in that way gaining their support. The members were given an "insiders" view of Conservancy hopes for Moloka'i.

The meeting adjourned at 9:00 p.m. for refreshments.

Respectfully submitted
Maria Leu

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TWO BIOCONTROL INSECTS PROPOSED FOR RELEASE AGAINST *CLIDEMIA HIRTA*.

Robert Burkhart, state exploratory entomologist, recently submitted his "Summary of Host Specifity Studies on *Lius poseidon* Napp and *Antiblemma acclinalis* Hubner" documentation to the State Board of Agriculture for consideration to release these two insects against *Clidemia hirta*.

Lius poseidon (Coleoptera: Buprestidae) is known to feed on other species of Melastomataceae. Both adults and larvae cause substantial damage to plants under laboratory conditions. Bob indicates that "*L. poseidon* will be most effective on plants less than one meter tall which grow in sunlight or light shade." However, Bob thinks that certain serpentine leafminer parasites already present in the Islands may also attack *L. poseidon*.

Antiblemma acclinalis (Lepidoptera: Noctuidae) has a fairly narrow host range only feeding on four melastomes in the field in Trinidad. The larvae are "voracious feeders." "They have a preference for smaller plants growing in shaded moist areas, places where the plant is a major problem" in Hawaii. Unfortunately, the larvae will probably "be attacked by established parasites and predators."

OBSERVATIONS ON PU'U KUKUI

John Obata
1337 Ala Aolani
HONOLULU HI 96819

We were privileged to spend Nov. 13-17, 1987 in one of the most pristine native wet forests in the state of Hawai'i. The eternal wetness and chill did not dampen our enthusiasm for this unique forest complex. Our eventual destination was a distant large bog beyond Pu'u Kukui summit with no trail, unknown direction and a fog cover making the challenge rather exciting. It turned out to be larger than the famed Eke bog and practically free of any alien flora. Practically free because several seedlings of Tibouchina herbacea had to be removed from bogs beyond Puu Kukui. A mature, flowering specimen enroute to Pu'u Kukui was destroyed along with several seedlings which also dotted the trail in the bogs enroute to Pu'u Kukui. The carrier of Tibouchina to the bogs beyond Pu'u Kukui seems to be birds because they are so dispersed. In the bogs, enroute to Pu'u Kukui, feral pigs, or perhaps hikers, are the more likely culprit as seedlings seem to line trails.

As for feral pigs, they were seen and their destructive activities noted even beyond Pu'u Kukui. A family "dwelling," with the famed pig nest, was observed just beyond the summit of Pu'u Kukui.

Reflecting after a similar visit two years earlier, it seems that the feral pigs have destroyed many of the formerly abundant lobeliads along the trail and are now beginning their assault of the bogs of the Pu'u Kukui summit area. Freshly eaten Pu'e (Lobelia gaudichaudii var. gloria-montis) was scattered along the trail even beyond Violet Lake. One of the culprits even had to be encouraged to take a backward route.

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DIMORPHISM - A QUESTION FOR FURTHER RESEARCH

John Obata notes that Peperomia is known for its dimorphism in the transitional stages from the vegetative to sexual condition. In Hawai'i, some species display this trait more dynamically than most. A tree of hoawa ((Pittosporum cauliflorum (C. confertiflorum)) in cultivation displayed a more unique transition. One year the inflorescence was perfect. Another year it became pistillate. This past year it was both, with pistillate predominating. Do they have seasons when flowers are mostly staminate? Is this a normal behavior? Are lean or barren years of fruit production due to changes in sexuality or ecological conditions?

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
HONOLULU, HI   96822

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Newsletter
Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

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THE NOTES OF WILLIAM BRACKENRIDGE MADE DURING HIS SANDWICH ISLAND SOJOURN 1840-1841

Evangeline J. Funk
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
HONOLULU HI 96822

William Brackenridge was a twenty-eight year old horticulturalist, newly arrived from Scotland, when he was asked by the Secretary of War, Joel Poinsett, to sail with the U. S. Exploring Expedition as assistant to William Rich, the expedition botanist. Brackenridge's assignment was to "care for and ship back live specimens and to care for and collect seeds and wood samples, plant specimens", and to assist Rich in general.

As you will see, Brackenridge was an extraordinary hiker and collector. Along with Charles Pickering, he was to be one of the first westerners to visit many places in the Hawaiian Islands. Together they were to collect 883 plant species in this archipelago, the most thorough collection made of any island group by the Expedition. Richard Dana would describe Brackenridge as invaluable to the scientific team although he was without title or official capacity.

Captain Charles Wilkes - leader of the Expedition, required that all members of the scientific team keep "day books". For years it was believed by Hawaiian botanists that the field books of the plant collectors had been lost. It is true that so far, the writings of William Rich have not been found. I was fortunate enough to obtain a copy of the field notes made by William Brackenridge while he was in Hawaii. I have transcribed them as faithfully as possible. Brackenridge's handwriting is quite legible except for some abbreviations and words. No punctuation has been added.

Permission to publish this manuscript material has been granted to the Newsletter of the Hawaiian Botanical Society by the Museum and Library of Maryland History, 201 West Monument Street, Baltimore, Maryland 21201. Permission to make further reproductions of this material must be obtained from that institution.

SANDWICH ISLANDS

Sept. 24th. Our ship, Vincennes, came to anchor in the roads without the reef which forms the boundry of the harbour of Honolulu, Oahu.

25th Ran into harbour and moored close in to the American Corvet, Wasp. Found the schooner Flying Fish had arrived several days previous to us.
As both officers and men had for a succession of months been subjected to great fateigues and exposures, during the survey of the Fiji Islands it was deemed necessary by Captain Wilkes to grant a few days of relaxation from active duty. Seeing that a wide field was now open for making collections and having on hand a large stock of dry specimens, I considered it desirable to set about it at once, and through the influence of Captain Wilkes I secured an apartment at our Consuls Chambers - where I began to regulate and arrange the plants preparatory to packing. While engaged in this operation Dr. Pickering was occasionally bringing in a few plants from the sea board in the vicinity of the town. On the Peacocks arrival Mr. Richs collection

Oct. 1 was handed over to me to pack along with those from the Vincennes, by the

6th of Oct. I had got finished with my undone business and on the

7th I walked up the Valley of Nuhanu (Nuuanu) and ascended a spur of the main range of Mts to the west of the Pali. The path which I took led me along the crest of the ridge which was covered with trees of Metrosideros and Acacia, while a few scattered bushes of Epacridaea and Vaccinium serve as underwood, the most interesting feature of the vegetation that drew my attention was the great variety of Filices which every where decorated the banks and clothed the trunks of the trees, vast flocks of goats are making rapid inroads from the plains into the forests at the base of the Mts. destroying the Banana plantations - generally found in groves sheltered by the groups of the _Aleurites_ _triloba_. Having fairly loaded myself with plants and having picked up several species of shells belonging to the genus _Stuartia_, I returned to town late in the eavening well pleased with my first ramble on this interesting Island---.

8th Employed in laying in the plants of yesterdays collecting for preservation, and preparing to ascend the Mt. to the east of Pali.

9th On the early part of the afternoon Dr. Pickering and myself started and in order to shorten the distance took shelter for the night in a native hut well up the valley towards the Pali where we procured a Guide, and a native to carry our little provender. After enjoying a good nights rest we started early in the morning towards the precipice

10th which slopes abruptly towards the west - wading up to the hunches in wet grass and labyrinths of bushes till we reached the base, then began the tug of war. Our guide who had before been part of the way up the precipice kept a scrambling forward occasionally loosing his way - then returning back to proove a fresh pass, the rock being rather fragile - and bushes to lay hold of scarce, a tumble by any one of the party became nothing strange till we reached the brow of the ridge. When the vegetation became so dense and intangled with the twisting stems of a species of Freycineta, that we were compelled to walk upon or crawl beneath them, in this manner we kept beating our way onward till we came to a spot where our guide told us (for he could speak a little English) that two individuals whom we concluded had been Frenchmen, had been brought up all standing, and so were compelled to make the best of their way back, the Dr. and myself having a little more determination, proceeded onwards taking the lead alternately, our guides being pretty well used up - till we reached the summit, which was about mid-day. The weather being fine and clear we had a beautiful view of the North side of the Island - beyond the Pali - which is flat with gentle undulations and well watered and studed with Native villages.

On the top of this Mt. which so far as we could learn - no individual had ever reached, we partook of a small collation and then began our descent - collecting specimens of all the plants that came in our way, near the summit several species of very handsome Lobeliaceous plants were picked up - these alone would have repaid us for our trouble, had we not found an interesting Aralia, a Schizaea on trees, several Compositae of singular habit, a number of neat little Mosses and ferns, these with a vast number of other plants furnished us with a load before we reached the base, where we discharged our Natives and made our way for Town which we reached about eight o'clock in the evening - not a little pleased at having performed an exploit that had baffled the Frenchmen, and an individual belonging to Honolulu who was three days in making the attempt, and according to his own account came near getting lost in the fog and rain before he could make his retreat------------.

11 th Employed in drying specimens - regulating and laying in the fresh collected plants. Owing to the dryness of the climate, plants can be preserved with great facility provided they are kept clear of insects.

12 th Paid a visit to a number of residents Gardens about town, found them in general in bad order, the climate at Honolulu being dry, artificial irrigation becomes necessary. Water is thrown up by pumps the machinery of which is propeled by the wind. Several exotic plants have found there way into these gardens which will be mentioned in there proper place.

13 th Made a trip to one of the small ravines which leads into the great valley behind the town, the face of the Mt being

deeply clothed with, and the locality moist, Ferns in particular were very abundant, the Genus Asplenium prevailing and I have not the least doubt but several species of this genus will - when examined- furnish new Genera, in this district - Sandalwood has become scarce and to the height of 2000 ft. I found none---.

14th Although I returned early the previous eavening I did not gain admittance to the Consuls Chambers - the regular hours of doing business having transpired, which compelled me to do all my business in the way of shifting and drying during the day - which prevented me from collecting as much as I would have wished.

15 th Walked up as far as the Pali and examined the vegetation on the precipices. The violent gusts of wind which swept through the gap was like to have swept me away, in crivises of rocks a species of Urtica, several small Plantagos and a Carix were among the most interesting plants found-on each side of the path leading to the Pali and a little after you clear the Taro patches, vast thickets of Hibiscus tiliaceas, (Hou) streches in towards the base of the Mts. which form the valley where the Aleurites triloba (Kukui) succeeds it and which is again followed by a mixture of trees and shrubs of the families of Contortae, Rubiaceae, and Urticeae, with occasionaly vast plantations of Bananas in rich sheltered situations.

Oct 16 th Employed in preserving Botanical Specimens.

17th Made an excursion up Valley about three miles to the east of Honolulu. Found several bushes of the Hibiscus youngii.

18th Sunday

19th Working among specimens and drying seeds.

20th Took a walk along coast towards Diamond Hill in search of Fuci and other marine plants.

21st Started in company with Doctor Rooke to examine the Mountains which lay N. West of Honolulu about six miles, having provided ourselves with horses, the road was good and the ascent gradual, we rode on till we reached the forest line when we dismounted - tied our horses to a tree and proceeded on foot up the ridge, which was densely covered with the Acacia (Koa), a kind of Viscum grew parasitical upon it. Solitary bushes of Sandalwood, Santalum Freycinetium Hookerii B.V. of stout growth were now in flower, two species of Scaevola -of dwarfish habit was found in exposed situations. We found to deviate from the trod path was impossible owing to a rambling species of Fern, "Glichenia" which entangled us when we made an attempt - on our return to the base we took shelter for the night in a cottage belonging to the Doctor -------early on the morning of the

22th we returned to town where I spent the remainder of the day in sorting the collections.

23rd Rec'd order to hold myself in readiness to repair on board Schooner Flying Fish at shortest notice - bound on a surveying cruize to the Island of Kauai, the most western of the Sandwich Group.

24th Nothing definite as to the time of Schooner sailing, put all the dry plants in safe keeping till our return.

25th Early this morning a signal came from the Schooner - demanded our presence on board at 1/2 past 9 a.m. Got clear of the reef outside of harbor. Wind S.S. East = light, the individuals composing the Scientific party consisted of Messrs. Peale, Dana, Rich, Agate, Dr. Pickering and Myself, passenger Capt. Grimes, Pas'd. Mid-S. Knocks command of Schooner - on the afternoon of the

26th eastern point of Kauai appeared in sight.

Oct 27th At ten o'clock we effected a landing opposite to Koloa, where we were kindly recieved by Captain Knutsen and Mr. Peek, Mr. Gulick belonging to the Mission being absent at the time, the Sugar Mill and Mission establishment stands about a mile back from the sea board with a well made road leading to it immediately behind this the extensive Sugar and Mulberry plantations of Messrs. Ladd and Co. - the latter stretching upwards towards the seat of Mr. Peeks house, which is situated on the brow of a hill at the base of the Mts - is perhaps one of the best chosen localities with regard to a fine prospect to be found on the Island. Attached to the Mulberry plantation are several large houses built in the native style - fitted up as feeding houses for the insects and reeling of the silk the whole of which labor is performed by the Natives under the superentendance of a young man from the U. States. In a small garden close by I observed Amaryllis aulica, Turneraceae sp. and several other Brasilian plants brot by C. Knutsen from St. Catherines.

As our orders only authorized us to spend six days on the Island and recommending three different routes to be made, by the party dividing itself into as many divisions, -- one to go around the coast by the eastern extremity, another to cross the Mountains in the interior while the third was to cut off the promontory to the west by way of Waimea and the whole to meet again at Waioli, to be there taken on board the Schooner again, My companions in associating themselves showed a lack of unanimity of feeling, for my own part - I kept back to join with the weak side, before night I found it was agreed by Mr Dana and Agate that after taking a view of the water fall on the Mts to ride through a valley till they reached the flats on the opposite - or North Side, and that Mr. Rich and Peale were about to take the same way, leaving Dr. Pickering and myself to take the western route which could only be performed on foot account of the many dangerous passes to encounter, so that the middle and eastern routes were set aside.

28th After breakfast Dr. P. and myself shouldered our collecting cases and proceeded on our way in order to reach Waimea in the early part of the afternoon, the distance being about 18 miles----------------.

The country between Waimea and Koloa, through which we passed presents a number of Sun burnt Hills, between which are barren plains enclining from the base of the Mts. towards the ocean, intersected with Gullies or Gulchies (as they are called on the S. Islands). A few sorts of coarse grass with a number of annual plants and three or four Malvaceous shrubs enclude the principal part of the vegetation. Native habitations are very sparsely distributed over this arid district owing to the want of water to grow Taro for there subsistance. In one or two valleys were gentle runs of water in the vicinity of which a few huts and Taro beds were observed.

About four in the afternoon we reached Waimea, in approaching which we passed The Fort which the Russians built on the east bank of a stream which runs through the town. The breast work which is of mud and stone is fast giving way and many of the gun carriages have fallen to pieces, the whole fabrick is as fast coming to nought as did the influence of Doctor Schafer on the Island. Having letters of introduction to Mr. S. Whitney of the Mission, we were kindly recieved at his home where we remained for the night. Mr. Whitney having procured two guides for us we started at nine A. M. to cross the

29th mountains for Waioli, when only a little way up the ridge we found Mr. W's generosity exhibited in the presence of a native loaded with provisions and cooking utentials to serve us in the eavening and following morning. We had travelled pretty hard for four or five hours on the crest of a barren ridge before finding a single plant worth the picking up - when a few stunted Acacia and Sandal-wood bushes made there appearance, by the time we reached a deserted Hut which was about four in the afternoon, it came on to rain very heavy, here we would now have taken shelter for the night but our guides carried us on about a mile farther to a miserable low shed which we had no sooner entered than myriads of fleas were found marching up our pants and the rain forcing its way through the roof in all directions, so that we did not require to think twice about returning to the deserted Hut we had passed a mile back. Nevertheless that the rain fell from the heavens in torrents. A fire was soon kindled inside by the Natives and contrived to cook a little Tea from some water which our guide procured from the hollow stem of a tree, altogether we made a good supper of it.

Oct. 30th Having made tolerably well out during the night with regard to warmth and other comforts, we found the morning wet and threatening to continue so, prepared some breakfast. Sent the native with the cooking utensils back to Waimea, and proceeded on our journey, the vegetation now began to be somewhat interesting and luxurient (we were now about 2500 feet above the level of the sea) and the soil of several open glades through which we passed appeared to be well adapted to the growth of wheat or Irish potatoes - large tracts being free of wood and pretty level, in many of these open places a sort of wild cabbage grew in great abundance and wild hogs are numerous, having started a good many in the bush and traced there rooting as we went along. About eleven o'clock it came on to blow heavy accompanyed with rain. My companion and guides were inclined to return to where we had spent the night, against which I remonstrated when we all went on again for some time till we reached the table land or Marshy district which streched a considerable distance along the top of the Mountain, here my companion fell somewhat behind and our guide showed symptons of giving out. As we were going every step above the knees in quagmire, so that I was compelled to stimulate them a little with some Brandy that I had brought with me as a standby. In this swamp are many interesting plants. I picked up going along - Acana sp. - Drocera sp. - Daphne sp. - pth. = globular dark red - large= Pelargonium sp. Plantago sp= with several interesting grasses, it rained so that we could not see more than 200 yds ahead of us and about three p.m. we reached the summit of the Pali famous for its abrupt and prolonged descent - which we began as cooly and I may say as moistly as was ever a poor devils who had been dragged through a stream in the Month of March by slipping, tumbling, scrambling and swinging ourselves down by the bushes. We reached the margin of the river at the base of the precipice about half past four, the river was very much swollen by the heavy falls of rain and as our path lay on the opposite side, were obliged to ford it up to the arm pits, and to obviate a repetition of this had to force a path along the bushy banks or headlong through the muddy taro patches, walking being very heavy. And night closing in fast upon us. My companion fell behind and it was not till late in the eavening that he overtook me at a native house where I had some supper prepared in the shape of a chicken and some roasted taro. Our shift of clothes being all wet through we were compelled to wrap ourselves up in mats and retire to a corner to rest for the night.

31st Felt rather stiff this morning from the effects of Yesterdays hard labour on walking out to wash found several large Orange Trees (sweet) loaded with ripe fruit on which we regaled ourselves before breakfast. This valley which is called Wainiha, is one of the richest in its products and most picturesque in its scenery of anything of the kind we had observed on these Islands, on both sides the mountains rise abruptly with beautiful cascades falling over there brows a height of 1500 feet, bossed with vegetation of almost every tint, the Candle Nut Tree, with the Banana, Breadfruit and Sweet Orange fill the base of the valley with occassional intermixture of Taro patches and plantations of Broussonetia papyrifera, from which they manufacture their fine Tapa, we were now five miles distant from the beach, and as much more from Waioli, after proceeding three miles down the River - we had to hire a Canoe to ferry us across, we shortly had to pass over several high promontorys the base of which was lined with forests of Pandanus the smell of these flowering being so powerful as to be felt two miles distant, crossing several pools of deep water in Canoes we kept winding our way along the coast till we spied the Village of Waioli situated at the head of a deep bend or bay on a flat. We reached the Missionary Establishment at about mid-day and was kindly rec'd. by Mr. E. Johnson, Teacher. On inquiry we found that Messrs. Rich and Peale had arrived the previous eavening and had taken a stroll on the mountains in Co. with Mr. Alexander at whose house they had taken up there residence. Messrs. Agati & Dana arrived in the eavening on Horseback, towards the close of the afternoon began to dry our plants as they had been very much saturated with the constant rains we had experienced on the Mts.

Nov. 1st - Sunday, Took a walk around the village, had a view of the Sugar plantations in the vicinity and M. Alexander's Indigo patch - he has allowed his plants get to high so that these are become woody and scraggy therefore produced indifferent foliage, in fact the manufacture of the Indigo is not understood on the Sandwich Islands, where it grows very luxuriently and in many places as in Hido (Hawaii) it has run wild. - At 11 o'clock A.M. The Schooner Flying Fish was seen in the offing - she soon after came to anchor in the Bay when orders were sent to us to repair on board by Sundown.

Waioli I would say is one of the richest stations on the Sandwich Islands - Owing to its richness of Soil and situated as it is at the base of the Mts. = on the weather side where it is well watered with regular supplies of rain, almost every thing planted flourishes with the greatest luxurience. At Mr. Titcums Mulberry plantation I saw leaves of the Morris Multecuulis that measured 15 inches long by 12 broad, on young plants 8 months old, - Mr. Alexander of the Mission, a very intellegent man by the by, has been making a collection of the Ferns of the Island which he is occasionally sending home to Botanists in the U. States.

Removed on board Schooner in the eavening and at ten weighed anchor - bound for the I. of Oahu.

2nd Having had light winds during the Night = at 8 A.M. we were still in sight of Kauai - heavy sea running. Messrs. Rich, Pickering, Dana, and Agati, sea sick. In the early part of the day I busied myself in shifting the moist specimens of Plants.

3rd At 10 o'clock A.M. we were all landed at Waialua, a Town on the N. West - extremity of Oahu. Mr. J. S. Emerson is Missionary and Mr. Edwin Locke, Teacher, to the latter individuals house we repaired where Mr. Rich and myself spent the remainder of the day in laying out our Specimens and paper to dry, Mr. Agati being unwell rode on to Honolulu in Co. = with Captain Grimes. Mr. Rich and I engaged to lodge with M. Emerson for a couple of days in order to have an opportunity of examining the Mountains of Kaala. Dr. Pickering who felt sick made arrangements with Mr. Peale to return on foot the following morning to Honolulu by way of Ewa, while Mr. Dana with Mr. Locke entended to examine the North side of the Island and return by the Pali and valley of Nuanu--------

4th Mr. Emerson who had agreed to accompany us had Horses ready by 8 o'clock to carry us to the base of the Mts.= which we reached in an hour, where we left our Horses in charge of a Native, with another for our guide, we started as the priest said "Fair" on the top of a spur of the Mt.= by which it is said that Dr. Gardener reached the summit. We had not gone more than 500 feet up when it came on to rain - and the ridge being narrow at the top - to save our Necks we were compelled to get stride legs upon it and hitch our way up, A mode of traveling Mr. Rich soon became tired of, so he resolved to remain and collect till Mr. E. and myself returned, A circumstance which I thought would not be long in happening, as E.!! was complaining that his knees was beginning to get feeble, I had no idea myself that we could reach the summit that day, but as my companion was anxious to shew his walking powers, I was determined he should have his fill of it = so kept jogging along amongst brambles and bushes = soused overhead and ears with wet, when about 2500 feet high, both Mr. E. and the guide considered that the best policy we could adopt would be to retrace our steps, to which I consented and now began in earnest to collect every interesting thing that came in my way of plants, a species of shrubby Viola two feet high - flos = white slightly fragrant, Exocarpus cupressiformis the same as the native Cherry of N. South Wales, with several kinds of trees peculiar to this locality, and towards the base forests of Erythrina monospermas (Hooker); the wood of which on account of its lightness is preferred by the Natives for making Outriggers for those Canoes. On joining Mr. Rich we partook of a small lunch, and regaining our Horses reached Waialua about 6 o'clock P.M., the country around this place is flat, rocky, and unprofitable, but a little artificial irrigation behind the Town enables the Natives to raise a scanty supply of Taro, Bananas, a few bread Fruits are also to be found in sheltered spots.

5th My companion and myself had determined to start for Honolulu this morning so soon as we could procure guides, and about Nine A.M. all being ready we sallied from the Town accompanied by Mr. E. on horseback. Our path lay across the plain which connects the East and Western range of Mts = in the rainy season this plain affords abundance of feed for Cattle in three or four kinds of grasses = several streams of water desending from the Eastern range and intersect this plain and which might if properly managed irrigate the greater part of it, and I have no doubt that ere long Sugar and Indigo plantations will take the place of the Scraggy bushes of Sandalwood and other shrubs which you now find thinly scattered over its surface, we arrived at Ewa about 3 o'clock P.M. Mr. Emerson having parted from us on the way to visit some native Huts. We took up our abode for the Night - at the Rev'd. Mr. Bishops, where we met our chaplain Mr. Elliot who was accompanying the Rev'd. Mr. Smith's Lady on a visit of pleasure to Waialua. Our guides did not arrive till seven in the eavening - these people are regular pests to get along with you when traveling. Had it not been for Mrs. Bishop and her Botany - for she pretends to know more about it than what I am inclined to give her credit - for we would have spent a very dull evening. The rest of the party perhaps from a Godly fear of offending each other by opening their mouths, sat like Mutes, while dame Bishop kept analyzing plants - as she called it = with as much fluency as if she had been a professor of one of the first universities of the day, in the garden she had a native plant - Agati grandiflora - which I think is one of showiest things of these islands - in great perfection.

7th - At 9 a.m. resumed our journey - found road between Ewa and Honolulu very direct and good, the line had been marked out by Mr. Bishop, and the Natives had done the leveling part as government work, at 12 o'clock reached Honolulu, found all the rest of the party had arrived safe before us.

8th - Busy putting all the plant collection made this cruize, in order.

9th - Reported my return to Capt. Wilkes.

10th - Preserving and arranging specimens - and making excursions out to Mts. every alternate day till the twentieth when Doctor Pickering and myself (by order of Captain Wilkes) intended to start for the western point of the island.

20th - About - Mid-day - accompanied by a Native guide who spoke a little English. (I dislike Natives who have learned a smatter or our lingo) we left Honolulu sleeping all night in Ewa, resuming our journey the

21st - following morning by times, crossed the mountain in the early part of the fore-oon and towards eavening reached the village of Waiani, where we were kindly welcomed at the house of the Chief of the district.

22nd - We wandered along the coast to the west of the village about 6 miles - on our way we found near the beach a prostrate - seracious sp. = of Heliotropium. Farther back a sp. = of Cascuta among low bushes, ascending a ravine we skirted the base of the mountain = we found several very interesting half - deciduous trees, bushes of Sandalwood Santalum Freycinetianum, and singular species of Convolvulacea, a fruticose violet = flos = green placed on the old wood, on account of the small quantity of rain that falls on the lee side of these Islands the stems of the trees and plants are very succulent so that they can withstand a long drought.

23rd - On walking out this morning - on plains behind the village we found the Agati grandiflora, in a wild state = the flowers were smaller, colour dark orange. Those in a cultivated state were externally of a bright scarlet tint. We now beat our way across the flats, towards the mountains of Kaala which take from Barbers Point a circular bend towards the interior of the island with several arms or necks which jut out, and towards the west and or to the west of Waiani, where they form promintory along the sea board. On one of these arms we forced our way but was brought up early in the afternoon by a bold precipice which we could not surmount, an Artemisia, a shrubby violet and several pretty ferns - were the recompence for our trouble, returned to the village late in the evening.

24th - After paying the chief $4 for our lodgings, we started early on our return homewards in order to have an opportunity of spending a few hours on the mountain taking a different route from that which we had come over, our aquisitions in the plant way was very trifling - a new species of Morus, singular plant - belonging to the family Violaria, Dracenia of robust - habit, and one or two ferns. We reached Ewa, about sundown and found Lt. Aulden of the Vincennes surveying the Perle River, returned to Honolulu about mid-day of the

25th - In the afternoon reported myself to the Commander -

26th - Drying plants and paper, preparing to pack a number of N.S. Wales seeds - rec'd from Capt. Hudson of S. Peacock.

27th - Took a walk out as far as Diamond Hill - found a few additions to our collection.

28th - Packing up our collections, to remain at Ladd and Cos. stores till our return from the windward islands which we were now about visiting.

29th - Sunday - attended divine service at Seamans Chapel.

30th - Put in order and took on board ship Laussanes bound for N. York U.S. - a case of living plants from the Fiji Islands.

31st - Took all my collecting aparatus and a quantity of paper on board ship.

Decr. 1st - Preparing for sea, ordered on board.

2nd - On board ship packing away.

3rd - Sailed from Honolulu.

9th - This day the Vincennes came to anchor in Byron's Bay - Island of Hawaii, the object that Captain Wilkes had in view in visiting this place was so far as I could learn, to make a series of barometrical and other observations on the summit of Mauna Kea, also to give the naturalists an opportunity of examining its productions. Every facility on the part of the king and chiefs had been granted to effect this end, and Doctor Judd physician to the Mission at Oahu had accompanied us to act as Native Generalissimo and to act as interpreter for the Captain, Three days were spent in having the Natives organized and arranged in divisions, who were to carry instruments, tents, and provisions for the party.

14th - On the morning of this day we were to have started, but a delay was occasioned by the difficulty, Dr. Judd had in getting the Natives to start with their respective burdens, there was also a lack of natives to carry our clothing which compelled us to levy on the chiefs, whereby we were enable to get off at about mid-day. The party from the ship consisted of Captain Wilkes, Lt. Budd, Pas'd Mid.-Eld, Mid.-Elliot, Mr. Brinsmade, U.S. Consul, Dr. Judd, Dr. Pickering, Mr. Dreyton, Sergt. Stearriz, Capt., three boys and six seamen. A part of the Natives were to provide their own food and receive a certain sum of money - or its value in goods, while others were to have the provisions and pay of course in proportion. We made a tolerable fair start of it - the Natives taking the lead, the day was fine - path good, we managed to get through the forest a little before sundown, it was now - evident - we could not get the Natives to the rendezvous before dark, so we encamped at a place called Tuolo - till mid - night, when the moon rose we continued our journey and arrived at the station at five in the morning, where we overtook Purser Waldron on his way to visit the volcano of Kiraueah Peli; (Kilawea Pali) at this place we partook of some breakfast, started again afresh.

15th - Passing - and passed by parties of our natives, as Dr. Pickering and myself stopped occasionally to pick up plants, our walk today was along a flat open belt covered with grass and low shrubs - with the forest - bounding it on both sides, the path lay over masses, of smooth congealed lava of old deposit - in the evening we halted at several small huts - and as the natives came up Dr. Judd and his clerks mustered them and their burdens with a good deal of acumen, I enjoyed the evening laying my specimens into paper.

16th - We were all on the way by times and having to pass through a spur of the forest I stopped for some time in search of Mosses and Ferns - so that I did not reach the crater till eleven o'clock - Dr. Pickering and Mr. Waldren having arrived before me I went down on the lower ledge where I found Mr. Waldren and his guide returning, so I kept a feeling my way back till I reached the upper bank which is clothed with vegetation, our party when they came on pitched their tents on the N. west side of the crater, sent message back to ship for three seamen to come on without delay.

17th - This day was given to the Natives to recruit, the poor devils complained of their shoulders.

Kiraueah Peli (Kilauea Pali), is perhaps one of the greatest volcanoes in the known world and far surpasses the ideas I had formed of it from description, its position is about due S.S. west from Hido (Hilo), the height of its external rim - which is flushed with the surrounding country maybe about 3500 feet above the level of the sea. In place of the seat - of action = or orifice - on the top of a conicle peak or hill it is confined to a vast sunken pit from ten - twelve hundred feet deep, with three distinct shelves or ledges - the outer and higher one being about eight miles in circumference, the second is considerably smaller and from the brink of the third which surrounds the basin where two lakes or caldrons of liquid fire are in violent ebullition, the one towards the south end being the largest - though varying in its form - remained fixed in its position, while the smaller one towards the N. East end altered its position and at one time disappeared (with the exception of a fiery vents). Altogether, during our various visits, the large one often assumed for a short space of time a sort of quiescence, during the afternoon of the 17th the whole became agitated to high degree - and as if fresh fluid or heat had been added to the Caldron, it commenced a boiling and spouting up igneous fluid to the height of 40 or 50 feet which soon after overflowed its brink and flowed over the plain in rolling masses - forming one livid sheet of sparkling fire - and assuming all colours of the rainbow when congealing - the streams of lava on coming in contact with the gaseous substance emitted from the many cracks and crevices - was whirled round and spun out to small thread or flaxen hair in appearance, these gases also cause hollows or infations of the lava through which a person is apt to break at the risk of having his legs damaged. I made several attempts to reach the great caldron, but never got within 2/3 of mile of it = owing to the violent heat and gaseous vapors rising all around me - several individuals were fool hardy enough to approach the brink of one of the liquid basins - one of whom came near losing his life by it. Every step made in this place is treacherous in the highest degree, the face of the second or black ledge underwent material alterations during our visit. The brink of it had been undermined and considerably fallen in several conical peaks or chimneys had entirely disappeared, such is the continual change this hellish like laboratory is a working on its confines. The grandest and most sublime a sight that ever fell to my fortune to witness - was an outbreak on the eavening of this day which announced itself by a hollow thundering voice, which the force of its internal commotion produces, about 10 in the eavening accompanied by Mr. Brinsmade and several others we walked along the upper bluff on the west side till we arrived almost right above the great Caldron which was now throwing up its liquid glaring contents in furious jumbled sparkling confusion, though 1 1/2 mile distant from the scene of action the heat was felt very perceptable on our faces - everything around appeared lighted up - and the electric clouds which overhung the whole made one doubt the presence of terrestrial things, we gazed as if we should never tire of its brilliances, but all things has but time - and we walked to our tents to enjoy a few hours sleep.

At this end the upper surface of the rim of the crater is rent in twain which is prolonged by a continued chain of vents down to the coast in a S.S. West direction these emit smoke or steam and was no doubt a vien which connnected or communicated from a common center or head reservoir with several small extinct craters laying in the line of these vents or vent. Around the banks of the great crater are considerable sulfur deposits - and on the high ledge at the N.N. East end is a sulfur bank, open in action where we procured some handsome crystallized specimens, on the same ledge but forward on the brink of the precipice the steam emitted from the vents is condensed among the Ferns and Aristeas, which furnishes good refreshing water for visitors - a thing very scarce in these regions.

Spent the major part of this day in examining the savannahs N. West of the volcano, the Sandal - Wood, and a neat shrubby species of Pelargonium, a stately cestrum, several rubeaceous shrubs - one of which grows prostrate on barren places and produces round black berries about the size of a pea - and not unpleasant to taste, Strawberrys grow here in great abundance - no fruit, this not being the season, the Sandal - Wood on plains and banks of crater appeared different from any I thought I had seen.

18th - The whole of the party started afresh on our way for the big Mountain Mouna Roa; the road was good and destitute of clinkers for the first five miles - the general course was in the south westerly direction till crossing a flow of jumbled lava we inclined more to the west, skirting several belts of burnt trees, when about ten miles out from volcano we halted for the night on a low grassy hill, many of the natives did not come up till late, and a few sick

19th - for it. The path was soon about to disappear. The Captain and Consul left their chairs at this place - in which they had been carried from Hido, we had now the face of the Mouna Roa before us the ascent gradual, forcing a path amongst the low bushes and (Mamane) trees (Sophora species). As we had now passed the line of forest regions which I shall denominate the 1st. The kinds of plants ascending presented little new or different from that scene at the crater and its vicinity - with the exception of an Astrantia, = Pittosporum, = Pteris = Asplanium, = and a few interesting grasses, till we arrived at the height of 8,000 feet where

20th - it being Sunday we brought to for the day, the little supply of water we brought with us was getting used up, several of the party descended into the caves or subterranean lava passages, expecting to find pools of water, but got disappointed as the little dropped from the ceiling peculated or disappeared on the basin, here Sgt.

Stearns shot two upland Geese, the Vaccinium whose fruit we all enjoyed at the crater was here only in flowers and another species with blue berries began to make its appearance. About a half mile above our tents we found Argyroziphium Douglasii or silversword, for the first time, the Natives called this plant Ahena, to me tis one of the handsomest plants on these mountains. It was Captain Wilkes intention to have dispatched Lt. Budd and myself in advance to make a partial survey of the summit = and look for the supposed crater, but religous qualms of conscience on the part of the Natives and their leader put a stop to it, we here also killed a Bullock which was to have gone to the top but food and water failing we used him to strengthen ourselves for the route.

21st - I was amused with the faint idea our people had of mountain traveling and distances. When at the Crater many of them calculated on reaching the top in two days = here we were from it already three and the chance of getting up in another two, appeared to me but small, but others thought to the contrary; accordingly Dr. Judd and Sergt. Stearns with one of the seamen started ahead, but were forced to return to the party in the eavening, not having effected their purpose, during this days walk the vegetation had become more stunted and many of the plants have entirely disappeared those which now were found were more of an Alpine habit and thinly scattered among the heaps of jumbled lava, a species of Erigeron about three inches high appeared here (Mr. Budd's station) in its proper habitat. No shrubs with the exception of the blue fruited Vaccinium, were here observed. Several of the tents or their poles did not come up till late, and no soil to drive the pegs in, we were compelled to clean away the blocks of lava and lay them around the base of our tent to keep it from getting blown down, the wind on these unhospitable regions was cutting cold which made us pack together pretty close for the night.

22nd - Without partaking of any breakfast Messrs. Brinsmake, Drayton, and myself started at an early hour - determined to make a bold push to reach the summit, having no guide we made always for the highest point or block on some breast - of lava, this mountain on all sides being of gradual rounded swell - so soon as we made one of these points, expecting that it would be the crowner another such a one would make its appearance till my companions in a jocular manner concluded it had no summit. About twelve o'clock I got ahead of them some way and found myself all at once on the brink of the doubtful crater, which Mr. D. Douglas was reported to have discovered and surveyed, I felt not a little proud in being the second white man that had ever seen it, this crater is a large sunken pit.

Now extinct with the exception of a few vents at the base which still keep a steaming, Mr. Douglases account so far as I have seen is somewhat exaggerated, perhaps from the circumstances that he thought no one else would ever have an opportunity of refuting him.

Nothing can exceed the desolate and unhospitable appearance which marks the character of this rigid and unhospitable eminence, not a blade of grass or an animal to retrieve the eye from gazing on the bleak masses of inert matter - banks and fields of jumbled clinkers - flows of bronze looking lava whose curious and serpentine wrinkles show yet the direction of the current when in a liquid state subsequent to this block of it have been thrown up in all positions and inclinations which show the various flows of lava of which they are composed. During the winter months more or less snow is found on its summit but the few days of fine weather preceding our ascension had thawed it pretty well off still sheets of ice were to be found in almost every sheltered crack or corner, the cold cutting winds are not the worst sensations one has to endure - the rarity of the atmosphere disorganizes the stomach which is followed by violent headaches some of our people were powerfully affected but afterward became aclimatized.

On rambling round the margin of the crater I lost sight of my companions and not wishing to remain there all night I began to retrace my steps and went about three miles down from the crater I accidently met Captain Wilkes and a few of his followers who with a little wood they had brought up with them had made a fire in which they were melting ice in a pot - gave distance and directions how to hold for crater and received orders to repair down to the low country on botanical duty there being nothing for me to do on this unprofitable region. - Still farther down I came in contact with my companions of the morning. On our way found one of our seamen who had fallen sick. I carried him to a sheltered spot and wrapped him up in warm clothing, found also tents, tent poles, pieces of portable houses, instruments, calabashes etc. etc. = strewed on the track the Natives, poor devils!! so soon as the sun began to get low abandoned these burdens and run for it. No one could blame them they had neither clothes nor courage and there was little danger of anyone lurking about in these places to pick up parcels or waylay travelers. We reached Lt. Budds encampment in the gloaming, where it came on to blow and rain very heavy Dr. Pickering and myself who occupied the same tent felt both rather sceptical in trusting ourselves under it - but I took the chance of the ills that might befall me and had no sooner laid myself down when over came the whole tent flat upon me - made a small airhole - and soon fell fast asleep - in the morning was gratified to find about two gallons of water collected on the tent, the same evening Capt. Wilkes had his tent blown down the same way - but in place of rain he was exposed to biting sleet and snow being much higher up the mountain. Those of our people who got down into a cave in our neighborhood faired the best.

23rd - Messrs. Brunsmade - Drayton, and Mid = Elliot with 5 Natives and myself this morning took leave of our friends on the mountain, following the same old track we had not proceeded far when we met a band of fifty seamen from Vincennes - headed by Lt. Aulden - all in high spirits. We reached our old Sunday station about eleven o'clock, pushed on nevertheless that it rained hard and made the Captains Chair station at two in the afternoon. We here partook of some refreshments, and then determined to make the volcano that eavening. Mr. Drayton begun to show symptoms of this hard walk by laging behind which delayed the rest of the party somewhat. I busied myself in walking along in collecting such plants as we had not secured on our way up. At half past six in the eavening we reached our old camp at the great crater, but having no tent, we were forced to take shelter in a leaky Native shanty for the night.

24th - At an early hour this morning Mid = Elliot left us with dispatches which he carried for the ship, I commenced overhauling the mountain collection of plants. In the afternoon Mr. Brunsmade, myself and two Natives began erecting a comfortable hut which we afterwards lined with native Tapas. Received also some provisions from a stock that was about to be carried to the top of the mountain, as we had been sent off with two biscuit per man as our allowance.

25th - Christmas Day. This one was calculated to be held like all the rest that had passed since we joined the squadron in rather a mean way, but unknown to any of us Mr. B. had dispatched a native for a turkey which just arrived in time to be stuffed by our Consul!! and cooked in a steam vent by a Native just in time for dinner, Pilot John returned from Mouna Roa - reported all well! Engage Puhana as guide and six Natives to join us on the 28th to go to the district - of Hido, - weather very cold wet and bousterous wind N. East.

26th - At 9 a.m. started from the volcano - taking a direction S. west 1/2 South course from it - in order to reach the sea board, the possibility of doing which, in less than two days - was doubted very much by Dr. Judd; the whole country to the S. West of this crater is a flat barren waste of smooth lava and fields of drifted scoria, with bundles of Pelis hair fast to the bases of the stunted tufts of Silene and one or two compositae, till you arrive within 6 miles of the coast where the lava becomes more rough. Bushes of Metesideros and Sophora, Mamane, thinly scattered about tend the eye to the top a precipice about two miles back from the sea board, which I estimated to be about 600 feet high of loose blocks of lava thickly set with bushes and trees, among these I observed an amaranthaceous shrub of great beauty, two species of Pittosporums, Dodonea sp. = Aralia sp. =, from the base of this precipice towards the sea is a flat plain of smooth grassy lava, from the vents grew Agati grandiflora (Sesbania), which here has assumed a prostrate habit, a Daphne and two Rubiaceous shrubs with several grasses, - this plain teminates in a sharp perpendicular ledge against which the sea breaks with great fury. I succeeded in procuring in the shell way - Pattella, Buccinum, Trochis, and a Triton. I left the sea board about 2 o'clock p.m. and made the best of my way to get to the level plains of lava and scoria before dark, taking a long rod with me to act as a feeler for the vents. I arrived at the volcano between 8 - 9 in the eavening pretty well used up, during the whole of this walk I did not see a single Native or any traces of them in any way, but observed on the bank of bush wood, several wild cats and one single goat ----- distance 14 miles Sd.D.

27th - Sunday. Amused myself drying specimens of plants - in the afternoon took a walk with Mr. Brunsmade to the Sulphur Bank and collected specimens of crystallized sulphur, day very fine wind S. East, clear.

28th - Our guide Puhana being taken badly, sent one Kivi with ten Natives to carry our luggage, we were now about to go in search of the source of the flow of lava which burst forth on the 30 of May 1840 and devastated so much of the district of Punau (Puna?), our general course from Kiraweah Peli (Kilawea Peli) was south east along a well trodden path bounded on both sides with low shrubs and occasional batches of trees, on some of the last I found several very interesting small Ferns and Mosses, when about eight miles on our way the guide intimated to us that the flow of lava was not far distant, sent our Natives and baggage on to Kivi's home at the village of Punau,(Puna?). Turning to the left about 3/4 of a mile through a thicket of brush wood where we stumbled all at once upon an old sunken crater but shewed (showed) from the black lava in the bottom that it had been in action lately - the bushes on the upper bank shewing (showing) the effects of fire. While Mr. D. was taking a sketch of the basin, I ascended a small hill in the vicinity when I discovered a field of lava running in a direction a little South of West (East by North) with a number of Sulphur vents in violent action. I soon joined my companions and repaired to Punau for the night. The following day the 29th it was agreed amongst us that Mr. Drayton should return and make a more correct survey of the crater we had visited the previous eavening. While Mr. Brunsmade and myself was to take a cut across to the flow of lava, follow it up and join him at 4 p.m. At start our path ran S. East - then winding gradually around we made almost a straight North course, passing through a dense forest of high trees. Clearing this we make the eastern end of the flow. Here a sight - presented itself - a breast of clinkers 15 feet high, the roughest thing in nature, vomited from the bowels of the earth, there did not appear to me to have been any continued stream or current of fluid lava, but rather a continued chain of vents - by an internal convulsion, from which this crude material was ejected or thrown out in every direction, it also did not appear to me to have been in a highly heated state at the time it was thrown out as the bushes and plants which it had protrated or come in contact with remained uninjured, the course of this mass was E. N. East, through a dense forest of Trees. Owing to its roughness we were not able to walk along on the top of the mass, nor yet to follow its margin owing to it entangles state of the bushes. - Among the trees, we took a course nearly parallel to it, the Natives were now about to leave us - saying the way was not passable we were about to take, Mr. B. and myself kept on our guide followed and all astonished, we hit -right- upon an extinct crater the back and bottom was beset with bushes, we descended the bank which is about 150 feet high crossed the base which is flat and about one mile in breadth. One small vent near the centre was still a steaming - continued our walk in a West by South direction when we crossed many old sulphur vents - held then W.S. West - passed over a woody Hill and in descending found ourselves again in another crater - in one end of which was a deep pit the walls of which appeared to be fresher than that of the after one - we estimated the North bank of this pit to be 1800 feet high - the old bank to the south 800, this was clothed with bushes. I shall never forget the panick with which Mr. B. and the Natives were struck when scrambling up the faithless bank of this pit = but Mr. B. altogether astonished me. We arrived at Mr. Drayton's station before four O'clock but found he had gone - followed hastily on and overtook him near Punau.

30th - Mr. B. and D. went to make a survey of the two craters we had discovered yesterday - while I went accompanied by a Native to examine the forest through which B. and myself had passed on way to flow of lava, in this place I found a good collection of Ferns - among them a Botrychium, an Araliacoeous tree, which was scarce and met with no where else by us - was now expanding its blossoms.

31st - We shifted our station to make for the flow of lava which enters the sea near the village of Puna, taking the same route that Mr. B. and myself had made on the 29th, Mr. Drayton took a sketch of the lava mass and we all passed on in a N. East direction till we reached a forest, then holding a little to the North west we crossed many vents in the forest, tending in a north direction which, were still smoking, in clearing the forest we got a head of our guides and shot past the path which turns up for Pahuhali, where we intended stopping for the night, when our guide came up it was dark and we took shelter for the night in an old native hut.

Jan 1st / 41 - Mr. Brunsmade went on to Hido, while Mr. D. and myself went back to trace the flow of lava to the sea board, reached Pahuhali about 10 o'clock, left our Natives there took a guide who led us through the forest till we reached the lava about 1 1/2 mile below its south extremity. Here had been a sweeping forest - devastation. The trees had been mowed down by the liquid fire, like corn before the reaper, its line of demarkation is bold no biteing in - or half done work, the whole is a general and complete sweep, there are a great many branches or wings to the main flow, extending up into the forest leaving belts of trees standing, - Near the centre of the flow is a rugged channel from which the major part of the lava appears to have been thrown out - this channel has several ramifications tending towards the outer wings, the lava that was thrown out in a fluid state is of smooth and occasionally wrinkled and twisted, subsequent to this there has been some convulsion whereby vast fields of rough blocks or Clinkers have been jumbled together so rugged as almost to render a passage over impossible, in many places the fire is still at work beneath which made it so hot that we were unable to stop for any length of time on the same spot. By pushing a stick into the crevices it got on fire in a few seconds - we surveyed about 5 miles of its length and where we left off we could see 3 miles farther down where it begins to turn a little to East of North. North being the course it held at the upper end, its breadth varied from 1 to 3 miles. We had no time to reach the sea board where it came in contact with the ocean which must have been a grand specticle - On our way through the forest passed through an extensive Bamboo break. Many of the stems, 5 inches through, collected several interesting plants and then returned to Puhuhali, the afternoon being fine got the specimens out and aired them -

2nd Got up by daybreak and by 6 was ready to start for the ship, which was our destination today. About 11 - A.M., got into the road to the Volcano and continuing our way on overtook Dr. Pickering - also on his way to the Ship from Volcano - reached the Observatory at Hido about Mid-day at 2 P.M. get boat - went onboard Vincennes.---------------

3rd Sunday, Squally with rain - overhauling specimens in Dr. Pgs. Room.

4th Rain --------" " --------

5th " " " -------

6th " " " -------

7th Heavy Rains " " ------- preparing to take a journey to Mauna Kea with Dr. P.

8th - With a White Man for our guide and ten Natives to carry our baggage the Doctor and myself started from Hido to ascend Mauna Kea. We took the route by way of the saw mill - which is about 7 Miles out from Hido and 3 miles within the forest - here we stoped for the Night with the Present occupant Mr. Simons, this Mill property belongs to Mr. Castles who now rents it out. The Machinery is out of repair and I believe will never be put rights as it has been a loosing affair from the start, ---------

9th Our natives, from a native that came up to them yesterday eavening learned that there Chief was displeased with them for having engaged to accompany us for .50 per. day that they should stand for $12 for the whole trip, 1/4 of which was to be paid to himself (these people being still in bondage to their Chiefs), finding that they would not proceed farther - Dr. Pickering went direct back to Hido to have the affair investigated while I kept them at the Mill till he should return, in Co. = with Messrs. Walden and Bennett. He repaired to Kinuha, the Chief, who denied having any knowledge of the affair, and that he would give the Native who said so 50 lashes, I am enclined to believe that this same Kinuha was at the bottom of the whole affair. It being consistent with his character and similar intrigues practised by the other Chiefs of these Islands, the Doctor, arrived late in the afternoon at the Mill, where I had been sorting a collection of Plants made in the vicinity.

10th This morning appeared rather impropetious for a forest tramp, a deal of rain had fallen during the night and the sky is still overcast = about 9 o'clock we mustered our Natives and started. Keeping the made or Corduroy road for the distance of two miles where we took a turn to the left through the forest till we reached a stream the waters which formed frequently fine cascades over the lava precipices. We followed the channel of this stream up - having occasionally to turn into the bush to avoid barriers and slippery places. About Mid-day the rain began to fall in torrents, the banks of the stream became so slippery that the Native could not follow us with their burdens. = so that we were compelled at an early hour in the afternoon to encamp in the woods - building for ourselves a small hut with fern leaves - here for want of dry wood to raise a fire we past a Miserable night.

11th These Natives are poor miserable improvident beings - taking no thought for tomorrow, no idea of distance or time and the sample we had with us was the poorest I had met with, we sent them ahead of us by times, this morning and endeavored to cook ourselves a little Tea by some dry bark we collected. - Continued to follow on the bed of the stream sometimes diverging from it through the forest. The Vegetation both yesterday and today was very luxurient, the trees consist principally of Metrosideros and Acacia, the ferns seem to vie with each other in beauty. We picked up several Genera and species of this tribe that we had not observed previously - saw on the banks a Lobeliaceous Tree about 25 feet high, stem 8 inches diameter, flos = short blue, stigma protruding = leaves oblong serrate = tree much branched. - Leguminous Climbing plant like Muttisia-no flos = Silene sp = of arambling habit - In the afternoon we came upon an encampment of natives who had been a Bullock hunting - of course illegally - as they are now Tabooed for 5 years.

We procured from them some Jerked Beef which we had cooked on the spot. We now left the bed of the stream - and struck through the wood in S. West direction past several Bullock skeletons, crossed many of these tracts, the ground was here much drier than down towards the Mill. Brush wood gradully disappearing and less intangled - the forest Trees more like Oaks in habit - stiff - Stubby - and over - grown with moss, 1 or 2 new ferns also shewed themselves - as an Aspidium, somewhat like filix masa. We stopped for the night in an open glade - at a place called by the residents - Duck Pond, from the number of these Birds found in a pool of water there - the more delicate sort of ferns round this place were much more blackened and cut up by the recent frosts.

12th By 11 o'clock we had cleared the forest and found that we had been taken by our guide much to the south, I would say that our distance from Hido was about 25 miles & the height of our position pretty near 6000 ft above the level of the sea; Region 1st; why the Region which I called 2nd - is termed - plains I can't devine, as the ascent is gradual towards the base of the higher Peaks, characterized by numerous Hills and nobs varying from 2 to 800 feet - with a surface between these - pretty much undulated and cut in by runs from the higher Mts =; this district being famous for the number of Wild Bullock found on it = I naturaly expected to find something like good pasturage, on the contrary - nothing but thin scattered tufts of grass and a species of Ranunculus - which is of so acrid nature that cattle don't prefer eating it. Making our path or route in a N. West direction we crossed several ravines and came too late in the afternoon at a cave or projecting ledge of lava, close to several small pools of water, here the air was dry - but perceptably cooler so that we were compelled to use an extra blanket for the night.

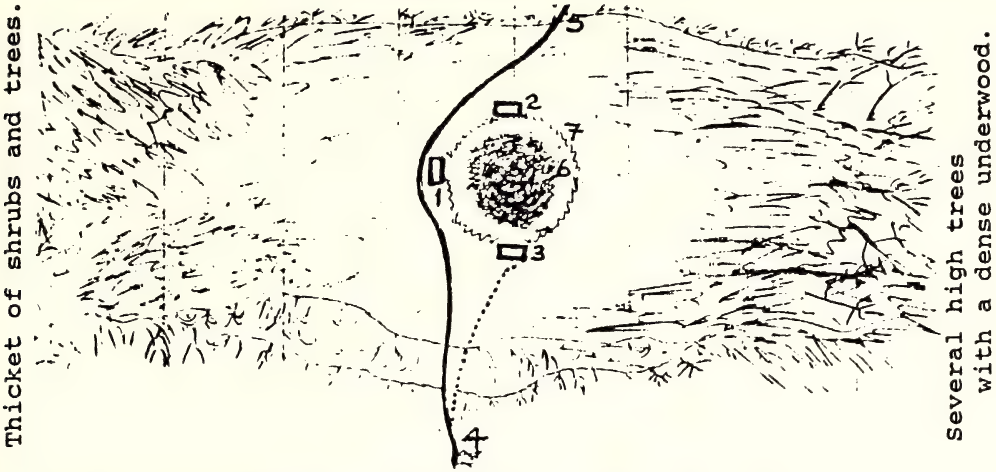
13th The distance travelled this day by us up the mountain was about 6 miles - passing a belt of Trees - consisting of a species of Sophora, (Mamanee.) A Compositeae, and Rubiaceous trees. Close above this belt commences flows of jumbled lava - or clinkers. Vegetation here begins to get richer and the variety greater particularly on the sheltered banks of the runs. viz. - Several Compositaeae 2 or 3 of which have decussate leaves, Pelargonium sp =. Epacridea 2 sp =, Vaccinium 2 or 3 sp =, Gnaphalium sp =, Erigeron sp =, one Labiate plant, Argyroziphium Douglasii, several Rubiacea, 5 species of Ferns, several grasses and other small plants of minor importance. About 3 miles above the Trees we fixed upon a cave where we intended to leave the Natives and the baggage while we ascended the high peaks, on account of the cold it was with some difficulty that we got them on this far before dark, being also in the vicinity of wood and water - was another inducement to choose this station as a rendevous, we had collected a good many specimens this day which I arranged and layed in paper to dry, - the weather was dry and clear.

14th Sent our guide out this morning in search of a Bullock - the liberty of killing as many as we wanted having been granted by the Governor, - Dr. Pickering - myself and a white man - Billy Duly - who had come up with us - started for the summit, when about three miles above our rendevous - keeping a high hill of red scoria to the South of our course when a vast plain opened itself before us - many miles in extent - here vegetation almost at once disappeared, no marked line of distinction to mark the termination between the Tropical and Artic verdure, the latter finding here little or no place. This plain which I shall call the 3rd Region is a desolate district of Boulder stones - gravel, Sand and Scoria - A few scanty blades of two Sorts of Grasses - with 1 or 2 Stone Mosses is all the verdure there to gladden the scene - the whole is like the dry bed of some great River course, no appearance of smooth lava streams or jumbled Clinker but appeared rather as if the whole had been overrun with water - or thrown up from the bosom of the ocean. Beyond this plain 6 Peaks, with a few minor elevations, forms the forth or terminal region, around the base of these peaks are considerable ranges of rough blocks of lava - as we ascended higher - near and along the summit of these peak - Scoria of a reddish colour - intermixed with small gravel or calcined lava. A cold biting cutting South West wind swept the crest of these peaks which often drove me on all fours, although I considered myself the stoutest of the party - Our Man Billy who took shelter behind a small heap of stones had his arms and feet so froze in a few minutes that it was with difficulty we could get him to move down to the base of the Mt. I had larded my face all over so that I suffered less from its effects at the time or after than did my friend the Doctor - who looked rather blue - to leeward or on another N. East side of the peaks, sheets of congealed snow extended down the distance of 4 or 500 feet and to windward it had drifted away - but numberless isicles pointing right in the winds eye kept a gingling among your feet. In the early part of the day we had a sight of Mauna Roa which appeared to be deeper covered with snow than at any other period we had yet seen it. The weather being now a little hazey our view of the country beneath us was very indistinct. We had no Barometer or other instrument with us to ascertain the height of these Mountains But I believe that Mauna Kea is several hundred feet higher than Mauna Roa - which is somewhere about 13,000 feet above the level of the Ocean.

On the highest peak we saw Bullock tracts but no lakes of water = which Mr Coutony is said to have seen. Mr. Castle who has hunted for seasons on these Mts. told us he had never seen any standing pools or lakes of water among the Peaks.

On our return to the Cave we found that our guide Jack had procured no Bullock, in fact he was to much of a flat, and I did not believe from what I saw of him at the Mill - that he had courage enough to take his person within Rifle shot of a bull - (we had procured a ships rifle for him.) - eavening very cold = proceeded two miles farther down the Mt. = to a cave that the natives had discovered.

15th The richest part of the vegetation laying right above the line of Sophora - (Mamanee) Trees - the doctor and myself concluded to follow it along to the N.W. Sending the Natives down to take a course in a parallel to us and to bring up at a place which Billy - who went with us knew. Saw many interesting plants - road very rough - saw Bullocks to the no. of 50 or 60 - observed at least 6 - or 800 skeletons of the same - they have now become shy being persecuted by the Spaniards so long. Got within Rifle shot of some fine ones, crossed through several pens which these people have made to drive them into - passed a Hunters House and made down towards Neds place which is nearer the forest margin. We now changed our course in a S East direction in a parallel with the forest line - this was the path which Mr. D. Douglas was pursuing - the fatal morning he left Neds house - walking about 3/4 of an hour in the above mentioned direction we arrived at the pits in one of which it is supposed he lost his life, at least in one of which he was found; the following is a rude outline of the place as I saw it, Mr. Douglas had, the fatal morning breakfasted at Neds house - on his way to Hido by the Saw Mill which he intended Making that night, Ned conveyed him to within 3/4 of a mile of the pits and warned him to be careful of them, that he should have passed by within a few feet of No. 1 and 2 then went to the top of the rising of the opposite side lay down his bundle, and return at least Twenty yards to have a look at the third is not to me like a sober enquiring mans actions, but such is said to have been the case - this same Ned (who is a runaway Convict from Sidney N.S. Wales.) is said to have cautioned him before parting and yet it is also true that when up on the mountain above the pits when he was apprised by a Native of what had happened, that in place of going direct to the pits to rescue, he went round by his house and did not reach the place till three hours after the natives. The dimensions of the pits are length 7 1/2 to 8 feet depth 8. breadth 4. like any oblong square the sides (at base are built of stone near the top logs the one on the top being the stoutest) none of the sides had properly speaking - fallen in - which is said to have been the cause of the accident - only some of the logs have given way from decay. The pit system was Tabooed at that time therefore have not been repaired since and remain still much about the same depth. These pits are all broad side to the gap in the fence and to deceive the cattle are laid across with Rasberry or other fragil stems over which is thrown a little grass and soil - when the whole is marked with an old Ox


Thicket of shrubs and trees.
5
2
7
6
1
3
4
Several high trees with a dense underwood.

1. Pit that was empty at the time he lost his life.
2. Pit in which there was a young cow at the time.
3. Pit in which there was a large Bull, the one in which he lost his life.
4. The place where he left his bundle and dog.
5. Path on which he was going south-west from Ned's House..
6. Pool of water - but dry when we saw it.
7. The fence to cause the cattle to pass near the pits through the gaps in the water.

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hoof. The locality of these pits are in a dell with sloping banks on both sides - that to the N. West being about 20 feet high - the S. East one 30, which is covered with low bushes of Epacris, Vaccinium, Compositeae - near the pits the Fragaria (strawberry) grows in great abundance. About 20 yards above the path a vast thicket of bushes and trees closes the dell and about the same distance below are several large Acacias - with few shrubs and ferns as undergrowth (Myrtaccous and Rubiaceous trees up the dell!) I was told by Men of good standing on these Islands - who saw the body of Douglas before it was salted, that there was a large deep wound across and behind the right ear as if it had been inflicted from behind by some blunt - weapon, the body was afterwards examined at Honolulu by Drs. Judd and Rooke. But whither there published opinion may be considered a veritable one of the case I am still very doubtful,

At 6 in the eavening we joined our guide and natives at an old ruined bark House where we tried with a good deal of scheming to rest for the night,

16th We had spent a very disagreeable night from the cold and moisture, a heavy dew fell when we resumed our journey. In the upper part of the forest the number of trees are greater then down near the coast, near our halting place we saw the following trees, Ilex sp. = 11 feet h 18 inches d=, Aralia sp = 50 to 60 feet high 2 feet = d. =, Myoporum sp = (bastard Sandal Wood) 35 feet = h = 15 inches = d =, Rubiaccous tree 3 or 5 sp = Rutaceae 3 sp = 30 feet high 14 inches d. Several Compositeae 20 feet high. Ardisia sp = 2. 40 feet high = 18 inch = d=, Meterosideros sp = Acacia sp = the largest and most abundant tree in this region. Sophora sp = (Mamanee) among the trees were a great many nests and mosses and Lichens. The path on our return was more to the north than the one we ascended by - a Silene - and 4 or 5 species of Lobelias, singular in habit = with handsome flowers mostly blue in colour, we had about 16 miles of deep luxurient forest to pass through the rain fell in torrents, we were almost every step up to the knees in mud and water stumbling over roots and scrambling over fallen trees till we were all with a few exceptions pretty used up before we reached Puohee a few straggling houses on a table land 2 miles back from the sea board 25 miles North by West of Hido, here was a small School House which we got possesion of for ourselves while the Natives quartered themselves on there brethrin.

17th Sunday, gave our people this day to rest, the weather being fine laid our clothes out to dry, the Dr. and myself walked down to the sea board - the coast all along here is bold. A bluff or bank bounds it as far away as Hido averaging from 4 to 150 feet in height. A Talinum and shrubby sp = of Plantago - were the best of the plants found this day.

18th Walked on towards Hido over a tract of rich fertile land - deeply cut in by numerous furrows (Gulches as they are called by the Residents) all tending from the forest line which is about 3 or 4 miles back (inland) towards the sea their depth is from 1 to 800 feet deep and often so close in a parallel to each other that you are no sooner out of the one than your gowing down into another - at the base of several of the largest are snug little native villages with Banana and Taro plantations adjoining. Some of the more industrious Natives of latter years begun to cultivate small patches of Sugar Cane on the undulations and flat places, where it succeeds admirably well. This cane they dispose of to the whites who have got Sugar Mills. Towards eavening made Mr. Castles residence who has already put out several 1000 young Coffee plants in the formation of a plantation which appears to be doing remakably well with him, his Sugar plantations are of great extent being a Carpenter by trade he has built himself one of the finest Mills on the Island. He prevailed upon us to remain with him all night = to which we were very ready to comply.

19th Mr Castles place is about 7 Miles from Hido, as we neared the latter the Bread fruit trees became more plentiful the fruit was laying under them rotting, these people never think of eating them except when Taro becomes scarce. At 3

P.M. reached the Ship.

20th Dr. P. set out for Pahuhali, while I was busy preserving specimens and seeds.

21st Do ....Do..........Do.............................

22nd Employed on board ship among specimens.

23rd Walked up in the afternoon as far as Saw Mill, remained for the night and on the

24th entered the forest in a S. West direction about 6 miles in search of Palms, which the natives call Brab and sold by them to seamen to make Hats of. I succeded by the guidance of a boy in finding three Trees, the only one that had fruit was about 25 feet high with a beautiful Corymb of leaves at the top = the frt is in racemes about the size of a Pigeon Egg, the whole habit of the plant is like Raphis flabellifolia and new to the flora of these Islands, having my Gun with me I shot Necturina Coccinea and 9 other species of small Birds - some of them very beautiful, I returned to the Ship on the afternoon of the

25th being afraid of the Birds spoiling. My plants were also in a bad state from the rain. I continued to arrange and get the Botanical specimens in a good state during the three following days without going on shore.

29th Went on shore with Mr. Drayton who was taking a sketch of a Pandanus while I collected Convolvula a tribe we had as yet paid little attention

30th to -- On board ship laying plants in papers ----

31st Sunday - Devine service was performed by Chaplain Elliot--

Febry 1st Making out a list of the plants collected on Hawaii, assisted by Dr. Pickering;

2nd ....Do..........Do...........

3rd ....Do..........Do...........

4th Cleaning Seeds, and Cutting specimens of Woods (native)

5th In Co. with Mr. Dyes made an excursion about 4 miles to the North of Hido - along the coast where I found a pale yellow variety of the common Scarlet species of Metrosideros so plentiful on all the Sandwich Islands (Ohea of the natives) also several handsome species of Dolichos.

6th On board Ship, working among Botanical collections ------

7th Sunday - attended divine service on board------

8th Walked up to forest about 5 Miles behind Hido to procure a quantity of Rasberry plants to carry home to the States---

9th Went on shore to Observatory procured some soil, planted Rasberrys on Box

10th Took a walk amon the Residents Gardens to see what they had in the way of exotic plants and trees ------

11th On board Ship doing sundry,;-----------

12th Took a stroll up and passed round the Two small extinct Craters ehind the Town of Hido, found a few Convolvulas to repay me for my trouble. I observed several acres of land laid out and planted with Young Coffee Trees - which have since been entirely neglected and now overgrown with rampant weeds. Coffee trees about Hido succeed remarkably well - as shown by the fine specimens in the gardens, no one has, if we except Mr. Castles, yet set about to cultivate it in a proper and systematic manner and I hope he will succeed to his wishes; The present Missionarys at Hido - particulary Mr. Coan with a bigoted narrowmindedness unbecoming the character of a christian, and a friend to the natives (as he pleases to term himself) has done every thing and used every means in his power to prevent the poor deluded natives from raising it. An employment whereby they could better their condition. He even refused one of his own countrymen a few fresh fruit or Seeds produced by plants raised by his generous minded predesessor Mr. Goodrich who was anxious to have coffee distributed among his friends and the Natives. Mr. Coan at length was base enough to have these old trees rooted out altogether -- this is a fact!! and I blush to think that my Professor of Religion with such a contracted mind and supported by the contributions of his countrymen. To shew his rottenness in the small sphere in which his little mind reaches in trying to do away with a beverage which all the civilized nations of the world use - and encourage the cultivation of ---Sugar cane arround Hido grows to great perfection. A party of China men have erected Mills and are doing a good business, the streams of water in its vicinity presents many fine sites for Sugar Mills. An active man with a Coffer of 10,000 Dollars might make an independent fortune here in a few years. Batavia Indigo, is here entirely run wild, no one has yet tried to manufacture indigo from it.

Febry 13th Making preparations to start for Maui, on board S.S. schooner Kahaliah by order of Captain Wilkes-----

14th Sunday - on board ship, attended devine service --------

15th At 10 A.M. went on board Schooner Kahaliah, Mr. Drayton Dr. Pickering made up the party. Mr. or Dr. Judd was also passenger in the Schooner to join his family at Oahu, did not get out of the bay till 3 o' clock P.M. Wind S. West

16th Nearly all day in channel between the Is. of Hawaii and Maui. Wind S. West,

17th This morning found the King's Schooner Herraw and Tender under the lee of East Maui being driven from there anchorage at Lahaina, by the late severe gale.

18th Dr. Judd and Mr. Drayton getting tired of the protracted passage was set on shore at a place called Walakaku, (Waikapu) 16 miles East of Wailuku,----

19th We had been tossing about all night in the channel and found ourselves under the lee of Molokai ---------

20th We were this morning close in upon Maui and by huging the coast, reached Lahaina at 1 o' clock P.M. M. D. and Dr. Judd having arrived about 1/2 an hour before us. On landing, Mr. Baldwin rec'd us friendly at whose house I went to reside. Dr.P. and D. to that of Mr. Richards.

21st Sunday - Drs. Pickering, Judd, Mr. Drayton and myself visited Lahainaluna, the name of the Mission Seminary for the education of Native youths (male) it is beautifully situated on the sloping side of a mountain about one and one half mile behind Lahaina, the building is two story towards the back, three in front (Having build against a sloping bank) Two ranges of small Huts for the Students built in the native fashion run out in the form of wings to the left while the teachers dwelling Houses form an ellegant range to the right about 200 yards = surrounded by neat little Gardens, immediately behind the Seminary is a large piece of land laid out as burying ground where several students have already been intered.

As bodily exercise the students to have to cultivate the Garden in front and grow vegetables on the adjoining grounds granted by the King for that purpose. In the Seminary they are taught Reading (in there own language) Writing, Arithimetick, Geography, Drawing and Engraving. and I believe musick - from the masterly manner they sung two hymns after the Revd. Mr. Dibble delivered a sermon to them in the School room which we all attended.

Returned to Lahaina early in the afternoon and attended the Native Church where Mr. Baldwin officiated. The Church was well filled and the natives appeared all very composed and listened to all appearance with great attention.

22nd Arrangements were made today for starting on a cruise to East Maui. In the early part of the day the Dr and myself took a stroll along the South strand and returned about Mid - day;

23rd With a band of eight Natives at 25 cts - per day, and Mr. Andrews from the Seminary with four of his scholars, - we left Lahaina for Wailuku, about 9 A.M., Mr. Drayton, Andrews and Son on Horseback, while the Dr. and I walked it. Our course was along the coast at first to the Southward, when we crossed the end of a rough range of Mts = by a zig-zag path. Circuteous in its general outline - till we reached Wailuku - which was about sundown where we put up at the Houses of Messrs Green and Baily of the Mission. Some misunderstanding taking place between Mr. D. and our natives. We

24th did not get off on our journey till 10 o'clock, when the Doctor, the 4 students and myself set out to examine the vegetation on the plains over which we had to pass on our way to the high mts = on the East part of the Island - we had traversed a great tract of low sand hills and found many plants new and interesting to us before Dr. Drayton brought up the party to which we found Mr. Baily - the teacher had added himself. We then walked on altogether till we reached the plantations of Messrs Minor and McLean, where we were very friendly rec'd. and handsomely intertained B.S. 2000 feet above the level of sea.

25th When the party started it was calculated that we would reach the summit of the mountain before night, but a heavy fall of rain coming on after mid-day we were compelled to seek shelter in a cave for the night. Rambling about in the bushes

26th in the morning before starting I found Two species of Pelargonium. One with dark crimson flowers and the other with pale stained lilac ones. Both species attain the height of 10 feet. The base of the trunk from 3 to 4 inches through, the small silvery species peculiar to Hawaii was also common in the district in open exposed situations. A second species of Argyroziphium though not in flower - grew here in abundance, between this locality and the summit of the mountain, a thick mass of low shrubby plants = consisting of Epacris, Vaccinium, Pelargonium, Sophora, Compositeae, Rubiacious plants of various sorts, clothe the hills and undulations till nearing the margin of the crater when it becomes thiner and more humble, we found that the Argyroziphium veridi, below dissapeared gradually as we ascended and its place taken up by the silky one which is alone to be found

26th On high regions. I arrived at the margin of this wonderful Crater (Haleakala) about an hour before the rest of our party. On account of the dense fogs that swept through it I could neither disern its form nor depth. So soon as we all met, our course was directed toward several elevated points to the south of the crater, where Mr. Drayton wished to make some Barometrical observations; he made the highest point 10,200 above the level of the sea, and from the base of crater feet. The day came on to sleet and blow very hard so that our Missionary brethren I believe wished themselves home again at there comfortable fire sides. Several of the boys had never before either seen Snow or Ice, some of our people talked of building a rude wall near the margin of the crater to shelter us during the night, but the natives knew a thing or two different from trusting there tender frames up there to the violence of the storm - had taken shelter in a cave some two and half miles farther down the hill which our guide soon discovered, in fact, I believe he had told them to stop there and was right in so doing. It must be understood that men accustomed to study in a closet are but poor hands on a mountain cruise, either in scheeming for there personal safety or standing cold. At the cave there was a good fire and plenty of water close by so that it was not long before we had a comfortable Supper cooked;

27th Mr. Baily and Young Andrews, unable to stand the cold set out for Wailuku. Mr. Andrews Senr. and Mr. D. went to survey the crater, while Dr. P. and myself started to botanize down toward the forest on the north side, we found an Orchid (same as observed at Kauai, 2 Alpine Lycopodiums, Lysimachia sp = a very small fern like Woodsia = on rocks; Rubus sp = habit rambling - We descended on reaching the margin of the forest into a deep valley which forms on the north A vast break or outlet in that direction from the Crater the bottom and banks of this valley where we went down was clothed with low plants and trees = as we walked up towards the primitive or real basin of the crater, the trees gradually gave place to Ferns. Argysozrphium, Kaduas: etc etc with deep layers of Moss which covered from here to the edge, the flows of rugged lava that had been forced out in this direction. Soon as we got within the circuit of the crater we began our ascent = which proved for us both one of the most difficult pulls we had encountered during the cruise-

28th Sunday, Students read from the Bible, afterwards Mr. Andrews elucidated to them various passages of Scripture - concluding with prayer, this being a fine day I overhauled our Collection of plants and laid out paper to dry.- D.P. took a short walk out among the bushes,

29th Mr. Andrews, Dr. P., Mr. D., and myself went to have a view of the east outlet of the crater = On the West bank Mr. D. remained to take a sketch of the whole basin or vault from the top of the bank which surrounds the vast hole - which is unlike any crater I saw on the I of Hawaii, in being of an Kneed or elbowed form We descended the west bank and walked along six miles in its base towards the east outlet which the course of the extinct vents or Mounts. The outlet to the north appears to have been caused by the heat of the crater giving way to the violence of the internal volcanic irruption.

In his journal, William Brackenridge made reference to the visits he paid to home gardens both in Honolulu and Hilo (Hido). At the back of his journal he kept a list of the cultivated plants he saw. The plant names are divided into several categories:

ESCULENT VEGETABLES CULTIVATED AT THE SANDWICH ISLANDS
Cabbages - late and early - the former grown by cuttings.
Cauliflowers - these don't succeed well.
Potatoes (Irish) Abundant on the Island of Maui.
Tomatoes - fine, in many places naturalized.
Mays - several sorts which succeed very well.
Parsnips - not very plentiful.
Pumpkins - very fine and abundant.
Squashes
Cucumbers
Onions - several kinds - but all small in size.
Garlic - introduced by the Spanairds.
Turnips - several kinds - but all small in size.
Radishes - white and long red salmon vars.
Parsley - very plain variety.
Chinese salad - (Crucifera).
Beans French - in abundance.
" Snap - very plentiful.
" Lima - grown strongly by the natives.
" An upright white var.
Peas - one or two sorts - don't do well.

Adesmia sp. from S. America, used for rencing.
Thyme and Mint.
Rice - grown in small quantities near Honolulu.
Wheat - principally grown on the Island of Maui.
Sugars grown on all the Islands.
Okra, Hibiscus esculentis.

ESCULENT VEGETABLES INDIGENOUS TO THE SANDWICH ISLANDS

Bread fruit (Artocarpus incisa), only one var.
Pandanus (Lauhala) necklaces is made of the nuts and mats and baskets of the leaves
Tribulus sp. used in cases of goneraea.
Hibiscus (Hows) bark is made into ropes.
Acacia (Koa) one of the finest woods on these Islands.

PLANTS AND SHRUBS INTRODUCED AND USED EITHER FOR ORNAMENT OF MANUFACTORING PURPOSES -

Acacia sp. like the Algeroba of Chili.
Mimosa sp. common in the gardens.
Agati grandiflora - if introduced?
Mimosa pudica - in almost every garden.
Hydranges - not common.
Dracana ferra - in gardens.
of Passiflora 2 species.
Asters, Cineraria, Zinias, Marygolds, Pinks, Carnations, Sweet peas, Balsams, Spondias guamoguelet, Ten week stocks.
Opuntia sp., Brugmansia arborea, Cereus triangularis, Bouvardia ternifolia, Chinese roses in all gardens.

FRUITS THAT HAVE BEEN INTRODUCED TO THE SANDWICH ISLANDS

Oranges - sweet - very fine on the Island of Hawaii.
" bitter very scarse.
" Limes in abundance.
" Cirons in abundance.
Grapes Black Wamburgh and white sweet water, Muscates.
Melons Musk and water in abundance.
Figs two sorts. Succeed very well.
Mangifera indica (Mango) Grown at Hido (Hilo)
Guava abundant all over the Eastern (side ?) of Island group.
Laurus persia (Aligator Pear) Hido.
Theobroma Cocao (Chocolade) I. of Oahu.
Peaches - at Hido - rather scarce.
Pyrus matus (Apple) very scarce.
Chili peppers in abundance.
Cofee - some good plantations on the I. of Hawaii. Also at Oahu by Captain Smith.

PLANTS AND SHRUBS INTRODUCED AND USED EITHER FOR ORNAMENT OR MANUFACTORING PURPOSES

Castor Oil plant (Ricinus communis, naturalized).
Indigo (Indigofera) naturalized at Hido.
Mulberry trees - three sorts - for feeding silk worms.
Rosa multiflora. Gardens at Honolulu.
Hibiscus rosa-sinensis. Gardens.

Cassia scandus and cabbage rose - in gardens.
Arnotta (Bixa orellano, in gardens).
Vinca rosea in every garden.
Jatropha curcas and Manihot - gardens.
Croton Tigleum - Dr. Rooke's garden.
Poinciana pulcherrima on flower fence.

ESCULENT VEGETABLE INDIGENOUS TO THE SANDWICH ISLANDS

Taro (Caladium esculentum) of which the natives cultivate 13 varieties. The native names of the following are, 1st Apuawai of stiff habit and leaves a light green colour. 2nd Poni red variety - tall in habit. 3rd Ipuleno Akea this is the variety most cultivated. Taro is planted by the Sandwich Islanders at all seasons of the year - either in rows - or in patches, the latter is the method adopted in planting their fish ponds. Luau is the native name for the leaves and stems of taro when they are cooked.

Yams (Dioscora sp.) Uhi of the natives, this root is so plentiful and so good here as at the Islands in the South Pacific.

Arrow-root (Tacca sp.) this article when prepared forms a very important article of commerce with these Islands.

Sweet potato (Convolvulus batata) perhaps introduced by the Spanairds. They have of these 33 varieties, 19 of which are of a red colour, and 13 white.

Sisymbrium sp. grows abundant about Honolulu and used by the residents as salad.

Fern root (Blechnum sp.) the core of the trunk is also eaten by the natives.

Black mustard - naturalized.
Cocoa nut - in abundance - but not much used.
Papaw apple (Carica papaya) abundant.
Rose Apple (Eugenia sp.) plentiful and fine.
Plantains - abundant.
Candle nut (Aleurites triloba) oil is made from the nuts.

****

PLANT AND CRAFT SALE

The Outdoor Circle -- North Shore Branch and the Waimea Arboretum Foundation will hold a Plant and Craft Sale on Saturday, June 18, from 9 a.m. to 4 p.m. on Waimea Falls Park's main lawn.

The special even is designed as a fund-raiser for the two non-profit organizations and will include the sale of locally handcrafted items and a wide variety of plants. For more information contact Irene Carpenter of the Outdoor Circle at 638-7997 or Shirley Gerum of Waimea Arboretum Foundation at 638-8655.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
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Newsletter Hawaiian Botanical Society

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RARE, THREATENED AND ENDANGERED NATIVE FLORA OF O'AHU

J. K. Obata
1337 Ala Aolani Street
HONOLULU HI 96819

This is a current status summary of O'ahu's endangered and threatened native flora following the Fosberg-Herbst (1975) format. This analysis is the culmination of about 30 years of field observations and an extensive field update during the past three years.

Any undertaking of this sort cannot be accurate as population estimates are not always quantitative. Numbers are always relative as there will be continual up-dating with new finds and losses. All O'ahu terrains cannot be surveyed, but a general cross-section was travelled in the past few years. Numbers given are documented to a reasonable degree. At times observation given by others have compounded the difficulties. Reports such as "all over the place" or "very common" sometimes amounted to less than ten plants when documented in the field. I am especially indebted to Steve Perlman for his company and assistance in the field and to him and Joel Lau for some of the recent rarer observations. Others have assisted with information on specific observations.

Species endangerment is not easily defined. Some use 1000 plants of a species arbitrarily as the cut off in continental situations. Hawaiian habitat and range are quite different from that found continentally. Area occupied by one species at times is limited and proportionately the number of plants filling this space also is limited. A species numbering 1000 spread over a larger area would be considered common in Hawai'i, but not on the continent. In Hawai'i, even a number of 100 sometimes may not be critical unless subjected to biotic and abiotic stresses. In fact, many species not listed in endangered and threatened tables exist in quantities of about 100.

Until recently, I considered anything over 100 plants in a species to be a safe index of survival in Hawai'i and therefore the species should not be listed as threatened or endangered. Previous to this survey, not many species were thought, by me, to exceed this number. This survey proved otherwise as many species seemed much more viable than previously thought. Unfortunately many species exist in a limited habitat, e.g. a single small gulch or a tiny segment of a single ridge.

In recent years some rapid abiotic and biotic changes have added caution to the acceptance of a summary such as this. Two major landslides extirpated much of the known population of two rare taxa. Extirpation of populations within several weeks following discovery by feral pigs also may not lend credence to some aspects of this report. The lobeliads fall in this category. Senescence also greatly reduced some populations during the last few years of this survey. Or perhaps a trip into areas not frequented in the past may change a taxon's status from rare to common. But this is how I have evaluated O'ahu's rarer flora as of 1987. Most observations are my own and because of the rarity of some taxa, much of their data had to be gleaned from Museum vouchers. Information from the _Manual of the Flowering Plants of Hawai'i_, now in preparation for publication by the Botany Department of the Bishop Museum, was made available to me. It greatly facilitated solution of a multitude of taxomonic confusions from the past. All taxonomic changes should be credited to the _Manual_ and not to this paper.

There were a large number of obstacles to overcome. Foremost among these problems was taxonomy and unfamiliarity with some of the taxa. Also there was some confusion in a few taxonomic treatments. Some genera will be treated casually instead of being totally omitted. Several formats were tried for this report, but none seemed to convey relevant details sufficiently. The present format may be voluminous, but at least it gives the best freedom of expression. Specific localities purposely were omitted to protect these rarer taxa from the unscrupulous.

Some taxonomic liberty was used by the writer to facilitate this report. Hopefully this crude attempt will aid those who are yearning for some quantifying data from O'ahu. Botanical terminologies were minimized to accommodate the non-botanically inclined. An asterisk(*) before a taxon denotes an addition not found in the Fosberg-Herbst listing. The listings are alphabetical by families following the Fosberg-Herbst format. St. John (1973) was used to determine the island origin. An epithet enclosed in parenthesis following the original Fosberg-Herbst epithet denotes a newer combination as proposed by the _Manual of the Flowering Plants of Hawai'i_ and a _MFPH_ will follow as a source of verification.. e.g. _Nototrichium_ _viride_ Hbd. (_N_. _humile_ Hbs. in _MFPH_). All references to the _Manual_ will be abbreviated henceforth with _MFPH_. Vernacular names are added by the author in quotation marks. May I emphasize again that this evaluation applies only for O'ahu. Some taxa may be rather rare on O'ahu, but common on other islands. Additional listing was kept to a minimum.

AMARANTHACEAE

Achyranthes splendens Mart. ex Moq. var. *rotundata* Hbd. (*A*. *splendens* Mart. ex Moq. in *MFPH*).
Three populations each are known from the Barbers Point area and leeward northwest O'ahu. Several hundred plants of this coastal taxon are documented. Barbers Point populations are numerous, but threatened by development. Easily cultivated, not long lived.

Aerva sericea Moq.
Not seen since Gaudichaud's collection in 1836 and presumed extinct.

Nototrichium humile Hbd. "Kulu'ī"
Commonly found along many of the lower to mid-elevation summer dry gulches and slopes along the entire leeward Wai'anae Range. Rarely seen today along the windward northwestern slopes. Numbers in the many hundreds and very common when found.

Nototrichium sandwicense (Gray) Hbd. "Kulu'ī"
Known from slopes west of Keālia to west of Manini Gulch. About 200 plants have been documented. Readily cultivated.

Notorichium viride Hbd. "Kulu'ī" (*N*. *humile* Hbd.in *MFPH*).
As the latter, common.

ANACARDIACEAE

Rhus chinensis Mill. var. *sandwicensis* (Gray.) Deg. & Greenw. "Neneleau"
Known today from upper Ho'omaluhia Park and was known in recent years from upper Nu'uanu and Moanalua Valleys from about 50 plants.

APOCYNACEAE

Ochrosia compta K. Schum. "Hōlei"
Known from both ranges and most common in drier mesic forests. Five hundred is a realistic number for this plant which is most common in the Wai'anae Range and the northern end of Ko'olau Range. Has been cultivated.

Pteralyxia caumiana Degener "Kaulu" (*P*. *macrocarpa* Hilleb. in *MFPH*).
Pteralyxia caumiana was the Ko'olau Range form of *P*. *macrocarpa* and was considered very rare. The latter is fairly common throughout the Wai'anae Range and usually found in large populations. It is regenerating and several hundred are known.

Rauvolfia forbesii A. DC. (Rauvolfia sandwicensis A. DC. in MFPH).
As the latter, common.

Rauvolfia sandwicensis Sherff "Hao"
Widespread from the drier to moist middle elevations of both ranges. Especially common in the Wai'anae Range. About five hundred would be a realistic number. Has been cultivated.

ARALIACEAE

Reynoldsia hosakana Sherff (R. sandwicensis A. Gray in MFPH).
As the latter, common.

Reynoldsia sandwicensis Gray var. intercedens Sherff (R. sandwicensis A. Gray in MFPH).
As the latter, a commonly encountered lower to middle elevation dry forest, as well as cliff-face dwelling, taxon. Observed along the northern and southern Wai'anae Range and most common along the leeward side. Also encountered along both ends of the Ko'olau Range. Quite abundant when found and number over 1000. cultivated.

Reynoldsia venusta Sherff (Reynoldsia sandwicensis A. Gray MFPH).
As the latter, common.

Tetraplasandra gymnocarpa (HBD.) Sherff
All varieties reduced to the species (MFPH). This taxon is now found mostly along the summit areas of the Ko'olau Range. Higher elevation populations are very depleted. Less than 50 are known.

Tetraplasandra kaalae (Hbd.) Harms and T. kaalae (HBD.) Harms var. multiplex Sherff - (T. oahuensis (A. Gray) Harms. in MFPH).
This form is found in the forested higher elevations of Wai'anae Range. Depleted and numbers less than 40 plants. Cultivated.

Tetraplasandra kahanana Degener & Sherff (T. oahuensis (A. Gray) Harms in MFPH).
Two trees were observed growing with T. oahuensis at Turnover Peak east of Kahana 17 years ago. Presently presumed extinct.

Tetraplasandra lydgatei (Hbd.) Harms (T. oahuensis (A. Gray) Harms in MFPH).
Three trees have been observed of this questionable taxon.

Tetraplasandra meiandra (Hbd.) Harms "'Ohe mauka" (T. oahuensis (A. Gray) Harms in MFPH).
All its many rare varieties are reduced to T. oahuensis

(MFPH). Tetraplasandra oahuensis is an earlier epithet for T. meiandra. A very common taxon from both ranges. Cultivated.

Tetraplasandra micrantha Sherff (T. kavaiensis (H. Mann) Sherff in MFPH).
Considered a juvenile form of T. kavaiensis (H. Mann) Sherff (T. turbans) in MFPH.

Tetraplasandra oahuensis (A. Gray) Harms " 'ohe mauka"
None of the varieties recognized (MFPH). This form formerly was known from south of Nu'uanu Pali. Common.

Tetraplasandra pupukeensis Skottsb. (T. oahuensis (A. Gray) Harms in MFPH).
No varieties recognized (MFPH). About ten plants are known from the northern end of Ko'olau Range and its specific status is still unclear. Field characters seem quite distinct while growing sympatrically with T. oahuensis.

Tetraplasandra turbans Sherff (T. kavaiensis (H. Mann) Sherff in MFPH).
Known today from upper Mäkaha Valley, central and west Makaleha Valley and the Pu'u Pane area. Was depleted till recently, but the populations seem to be regenerating today and about 50 trees are known.

BEGONIACEAE

*Hillebrandia sandwicensis Oliver "Pua makanui", "aka'aka'awa"
Once collected by Hillebrand on Mt. Ka'ala. Probably extinct on O'ahu, but not rare on Kaua'i .

BORAGINACEAE

Heliotropium anomalum H. & A. var. argenteum Gray "Hinahina"
A widespread coastal strand form. Numbers many hundreds, but threatened by encroachment of land development.

Heliotropium curasavicum L. "Nena"
A widespread coastal strand form, but not as plentiful as the above. Also threatened by encroaching land development.

CAMPANULACEAE (Lobeliaceae)

Clermontia aspera Wimm. (C. oblongifolia Gaud. in MFPH).
As the latter, common.

Clermontia multiflora Hbd.
Extinct. Last collected by Hillebrand in 1870.

*Clermontia persicifolia Gaud.
Today this taxon is depleted. Less than twenty-five are known along the mid-elevation and higher forest ridgetops of both ranges.

Cyanea
St. John reduced *Delissea* to *Cyanea*. However, the *Delissea* epithet predates *Cyanea* so he reduced *Cyanea* to *Delissea*. (Phytologia 63:2, June 1987)
This treatment will not depart from the traditional two genera. Aside from *C. angustifolia* and *C. membranacea*, all *Cyanea* on O'ahu are rare, apparently, due in part to the predation by feral pigs. The latter species is depleted today from its former state, but numbers over 100 in the mid-elevation and higher gulch peripheries of Wai'anae Range.

Cyanea acuminata (Gaud.) Hbd.
Was widespread in the past, but known today from only Makaua Gulch and being extirpated by feral pigs. Some regeneration noted. A recently described *C. ocultans* St. John is a synonym (*MFPH*).

Cyanea coronata Wimm. (*Rollandia lanceolata* Gaud. in *MFPH*).
As the latter, fairly common.

Cyanea coriacea (Gray) Hbd. var. *serratifolia* Rock (*C. membranacea* Rock in *MFPH*).
As the latter, fairly common.

Cyanea dentata Wimm. (*S. membranacea* Rock in *MFPH*).
As the latter, fairly common.

Cyanea grimesiana Gaud. "Noui"
Greatly depleted in recent years. About 25 are known from mid-elevation summer dry off gully floor sloping habitats of both ranges. Some regeneration noted. Rare today.

Cyanea pinnatifida (Cham.) Wimm.
Known from two plants today and restricted to Kalua'a Gulch, Wai'anae Range. Very rare. Listed as *Rollandia pinnatifida* by Fosberg-Herbst.

Cyanea regina (Wawra) Rock (*S. superba* subsp. regina (Wawra) Lammers in *MFPH*).
Was always rare. Not seen in recent years. Inhabited the upper Wailupe area.

Cyanea superba (Cham.) Gray
Known from disjointed populations of two adjacent gulches (Pahole and Kahanahä'iki) in the northern Wai'anae Range. Today 50 plants are known from both highly restricted populations. Some recent regeneration noted.

Cyanea truncata (Rock) Rock and var. *juddii* (C. Forbes) St. John (*C. truncata* (Rock) Rock in *MFPH*).
Was known from Makaua Gulch, but the population was

extirpated by feral pigs recently. A middle elevation Ko'olau gully taxon which aside from the above has not been seen in recent years.

Delissea
The entire genus is depleted and endangered in Hawai'i.

Delissea laciniata Hbd. Extinct.
Collected by Hillebrand and known only from the type.

Delissea parviflora Hbd. Extinct. (D. lauliiana Lammers in MFPH, a new combination.)

Delissea sinuata Hbd. Extinct.

Delissea subcordata Gaud. Variety obtusifolia not recognized (MFPH).
Not rare as more than 100 plants are known from several populations along the entire length of the forested Wai'anae Range. A mid-elevation canopied forest understory taxon. Regeneration noted, but this taxon is short lived (about 10 years).

Lobelia
Lobelioids are difficult to census as they are not long-lived. Populations fluctuate every 7-10 years and are constantly depleted by feral pigs.

Lobelia gaudichaudii DC. "Pu'e"
Thought to be very depleted 'till recently, but observed about 1,000 two years ago. The 1987 survey between the summits of Waimano and Aiea revealed none of the 500+ plants noted two years ago. Presumed extirpation by feral pigs. Today this taxon is very depleted in most of its range. The variety koolauensis Hosaka & Fosb. is known today from one fairly restricted population of about 20 plants. This form has white flowers and usually is multi-branched in its inflorescence.

Lobelia hillebrandii var. monostachys Rock. Extinct. New combination (L. monostachya (Rock) Lammers in MFPH).
Seen 50 years ago from Niu and Manoa.

Lobelia hypoleuca Hbd. Over 25 are scattered along the Ko'olau summit areas and Mt. Kaala today.

Lobelia niihauensis St. John var. meridiana St. John (L. niihauensis St. John in MFPH).
Known mostly from mid-elevation high, dry, rocky, cliff faces of leeward Wai'anae Range. One plant is known from windward eastern Wai'anae Range. About 200 are scattered from Mäkua

to Nānākuli. Population rather stable and not rare. Long lived.

Lobelia oahuensis Rock

Scattered along the misty windswept summits of Ko'olau Range and Mt. Kaala area. Field characters sometimes are difficult to delineate as they are closely associated with *L. hypoleuca*. Over 100 plants are known and some regeneration noted.

Lobelia remyi Rock

Extinct and known from only the type collection of Remy.

Lobelia yuccoides Hbd. "Pänaunau"

Known from summit and high ridgetop areas of the entire Wai'anae Range. Very depleted today, but stable and numbering over 100.

Rollandia

Except for *R. humboldtiana*, *R. lanceolata* and *R. longiflora*, the entire genus is stressed or rare. Much of the sudden depletion may be attributed to feral pig activity.

Rollandia angustifolia (Hbd.) Rock

Very depleted today. Found today from the higher elevations of the wet Ko'olau's. Less than 20 are known today. Hardly any regeneration.

Rolandia bidentata St. John (*R. lanceolata* Gaud. in *MFPH*)

Rollandia calycina (Cham.) G. Don (*R. lanceolata* Gaud. subsp. *calycina* (Cham.) Lammers in *MFPH*). *R. waianaensis* is a synonym of the latter (*MFPH*).

Generally a mid-elevation gully form to the near summit areas of the Wai'anae Range. In a canopied understory, over 200 are known.

Rollandia crispa Guad.

Known from wet mid-elevation gully areas of the Ko'olau's. Only known population today is from Makaua Gulch and nearly extirpated by feral pigs in a few months.

Rollandia degeneriana Wimm. (*R. lanceolata* Guad in *MFPH*).

As the latter, common.

Rollandia humboldtiana Gaud.

Scattered throughout the wet, misty summit and higher elevations of Ko'olau Range today. When found usually colonial. Over 100 are known and regenerating.

Rollandia lanceolata Guad.

A variable species found on both ranges usually from the understory mid-elevation summer dry terrains. Not commonly found in wetter, higher elevations. Estimated to be in the several hundreds and most commonly found near ridgetop habitats from Kapakahi to Niu and windward southern Wai'anae Range. Regenerating.

Rollandia longiflora Wawra
Today known from several isolated individuals and several large populations in upper Mäkaha Valley and Pahole Gulch. Inhabits mid-elevation off ridge top understories. Over 200 are known and regenerating. Ko'olau population not seen in recent years.

Rollandia pinnatifida (Cham.) G. Don (Cyanea pinnatifida (Cham.) Wimm. in MFPH).
See under the latter.

Rollandia st.-johnii Hosaka
Found today only along the misty, heavily windblown summits of central Ko'olau Range. Less than 20 are known today in several small populations. Recently two of the larger populations seemed to have been extirpated by feral pigs. Ranges from Kipapa to Hälawa and very rare.

Rollandia sessilifolia Deg. (R. longiflora Wawra in MFPH).

Rollandia waianaeensis St. John (R. lanceolata Guad. subsp. calycina (Cham.) Lammers in MFPH).
About 200 are known from the mid-elevation gulch understories to higher canopied habitats from Wai'anae Range. Most commonly found in windward southern Wai'anae Range.

*Trematolobelia singularis St. John
A recently described taxon. Known today from several populations along the heavily windblown, misty, windward facing cliff faces of the summit areas of Lanihuli and Kōnāhuanui. Population fluctates, but over 200 are known.

CAPPARIDACEAE

Capparis sandwichiana DC.
Several coastal populations are known and seem to number less than 50. The variety zoharyi Deg. & Deg. not recognized (MFPH). Fairly common on some offshore islets.

Cleome sandwicensis Gray
Known from early collections but considered extinct today. (C. spinosa Jacq. in MFPH).

CARYOPHYLLACEAE

Alsinodendron
This genus encompasses two endemic species and both are depleted and very rare today.

Alsinodendron obovatum Sherff
Known from ridgetop areas of the mid-elevation northwestern Wai'anae Range. Apparently short-lived (less than 10 years) and prefers the drier canopied understory. Known today from only one population of about 15 from Pahole Gulch environs. Previously known populations no longer exist. Very rare.

Alsinodendron trinerve Mann
This taxon was found around and between the wet forest understory of Ka'ala and Pu'u Kälena. Very depleted in recent years. Its habitat is disturbed by blackberry. Only a few plants have been seen in recent years. Very rare.

Schiedea adamantis St. John
About 30 plants are known from one very restricted population on Lë'ahi. Officially endangered.

Schiedea globosa Mann
Over 1,000 are known from sea level areas to mid-elevation ocean facing terrains from Hanauma to southern Waimānalo. Very common.

Schiedea hookeri Gray
Known today from lower to mid-elevation drier ridges of Kaluakawila to Wai'anae Kai. Less than 50 plants are known.

Schiedea kaalae Wawra
Known from both ranges in mid-elevation canopied dry or wet forests. Over 50 plants are known and most of them from Makaua Gulch. Wai'anae Range forms are rarer and found mostly today from windward southern Wai'anae.

Schiedea kealiae Caum & Hosaka
Known from the drier higher cliff faces east of Kealia and to the west near Manini Gulch. Several widespread populations numbering over 1,000 are known. Very common in its restricted range.

Schiedea ligustrina C. & S.
Generally known today from Kole kole Pass to southern Wai'anae Range. Occupies mid-elevation to ridgtetop dry, open forested areas or exposed areas. Over 100 known.

Schiedea mannii St. John
Generally known from the mid-elevation to higher, dry, exposed ridge tops of northern leeward Wai'anae Range. Over 1,000 known. Very common.

Schiedea nuttallii Hook.
Known today from one population in the northern Wai'anae Range. About 15 plants were observed recently. Rare.

Schiedea pubescens Hbd. var. purpurascens Sherff
Known today from higher ridge tops of windward central to southern Wai'anae Range. A scandent taxon giving the appearance of a large population, but quite often is represented by a single plant. An estimate of 25 survive.

Schiedea remyi Mann (S. globosa Mann in MFPH).
As the latter species very common.

*Silene perlmanii in ed. W. L. Wagner, Herbst & Sohmer (Sp. nov in MFPH).
A recently discovered taxon from the windward southern Wai'anae Range. Very restricted to a vertical rock face. First known silene from O'ahu. Less than 15 are known.

COMPOSITAE (Asteraceae)

Artemisia hillebrandii Skottsb. (A. australis Less. in MFPH). "Hinahina"
Very common along dry, rocky, exposed lower to high summit areas of both ranges. Realistically should number over 1,000.

Aster sandwicensis (Gray) Hieron. (A. sublulatus Michx. var. sandwicensis (A. Gray) A. Jones in MFPH).
Has not been seen since some of the early collections. Extinct.

The taxonomy of Bidens is quite confusing as hybridization is common and species variations are taxed to the limit. To ease the confusion, this evaluation will follow the up-dated Ganders and Nagata treatment yet unpublished as submitted to the MFPH. Numbers are generalized as populations fluctuate by its shortlived life cycle.

Bidens amplectens Sherff
Common to the drier mid to higher elevation areas of Kaipapa'u to Kuoakala, Wai'anae Range. Several hundred of the largest flowering Bidens of O'ahu are estimated.

Bidens asymetrica Sherff
Loosely scattered through the lower and mid-elevation level of the southern Ko'olau Range. Uncommon.

Bidens campylotheca Schz. Bip.
Found from the mid-to higher elevations in the windward northern Ko'olau Range. Not many are known as much of the range has accessibility problems. Probably not as rare as envisioned.

Bidens coartata Sherff (B. sandvicensis Less. in MFPH).
As the latter taxon, common.

Bidens cuneata Sherff (*B. molokaiensis* (Hbd.) Sherff in *MFPH*).
Few plants known from Lē'ahi. Officially listed as endangered. As the synonym of the latter, not endangered; at least on Molokai.

Bidens degeneri Sherff and *B. degeneri* Sherff var. *apiodes* Sherff
These two taxa reduced to *B. micrantha* Gaud. (*MFPH*). The variety not known from O'ahu and the former known from the original collection which is lost today.

Bidens fecunda Sherff (*B. cervicata* Sherff in *MFPH*).
Not considered endangered in its localized habitats from the leeward northwestern Wai'anae Range. This taxon exists where *B. torta* and *B. sandwicensis* merge and hybridize readily.

Bidens fulvescens Sherff (*B. torta* Sherff in *MFPH*).
Common as a synonym of *B. torta*.

Bidens graciloides Sherff (*B. sandvicensis* Less. in *MFPH*).
Common as a synonym.

Bidens macrocarpa (Gray) Sherff and *B. macrocarpa* (Gray) Sherff var. *ovalifolia* (Gray) Sherff (*B. macrocarpa* (A. Gray) Sherff in *MFPH*).
A common variable Ko'olau Range species found from the mid-elevation to the misty summits.

Bidens magnidisca Deg. & Sherff (*B. campylotheca* Schz. Bip. in *MFPH*).
As a synonym may not be rare.

Bidens micrantha Gaud.
Forbes collection was lost and the presence of this taxon on O'ahu is questioned. The variety *kaalana* Sherff reduced to *B. torta* Sherff (*MFPH*). As the latter considered very common.

Bidens populifolia Sherff
A common low and mid-elevation drier terrain taxon known from Ka'a'awa to Kaipapa'u.

Bidens micranthoides Sherff (*B. populifolia* Sherff in *MFPH*).
See above.

Bidens obtusiloba Sherff (*B. populifolia* Sherff in *MFPH*).
As the latter, fairly common.

Bidens pulchella (Less.) Schiz. Bip. (*B. populifolia* Sherff in *MFPH*).
As the latter, fairly conmon.

Bidens sandvicensis Less. and var. antrorsa Deg. & Sherff and var. imminuta Deg. & Sherff (B. sandvicensis Less. in MFPH).
As the last, common.

*Dubautia herbstobatae G. Carr
A fairly recent discovery chronicled by less than 100 plants from five separated populations. Mākua to Wai'anae Kai. Generally a high ridge top dweller, but also known from cliff faces of mid-elevation gullies.

Dubautia laxa H. & A. var. waianensis Deg. & Sherff (D. laxa Hook. & Arnott in MFPH).
As the latter, common.

Dubautia plantaginea Guad. var. pauoensis St. John (D. plantaginea Gaud. in MFPH).
As the latter, fairly common

Dubautia sherffiana Fosb.
A high ridge top taxon known from the northern Wai'anae Range to Pālikea in the south. Several populations are known. Only the Ka'ala population shows signs of regeneration. Over 200 plants are known.

Gnaphalium sandwicensium Gaud. "Ena'ena"
Known from high elevation dry, open habitats or coastal areas today. Occasionally seen and uncommon on O'ahu.

Hesperomannia arborescens Gray
Was known from the summit and higher leeward forests of the Ko'olau Range. Today known from one collection near the Läie summit area and five plants from high elevation Hälawa Valley. Extremely rare and endangered. No varieties and subspecies recognized (MFPH). Taxon depleted and in danger of extinction.

Hesperomannia arbuscula Hbd.
Known today from two populations in Mākaha and Wai'anae Kai. The famed windward Kalua'a Gulch population no longer exists. Less than 30 plants exist today. Regeneration sparse today. Rare. No variety or subspecies recognized (MFPH).

Lipochaeta dubia Deg. & Sherff (L. tenuis Deg. & Sherff in MFPH).
As the latter species, uncommon.

Lipochaeta integrifolia (Nutt.) Gray, var. major Sherff and var. megacephala Deg. & Sherff
All varieties reduced to the common L. integrifolia (Nutt.) Gray (MFPH).

Lipochaeta minuscula Deg. & Sherff (*L. tenuis* Deg. & Sherff in *MFPH*).

As the latter species, uncomnon.

Lipochaeta remyi Gray

Found from mid to upper gully and cliff faces from Dillingham Field towards Ka'ena Point in northern Wai'anae Range. Being an annual the population fluctuates from year to year, but numbers in the hundreds.

Lipochaeta tenuifolia A. Gray

More commonly known from drier open ridges and slopes from higher Ke-awa-'ula to Wai'anae Kai. Sometimes under a canopy. Two populations are known from eastern and mid-northern Wai'anae Range. Regenerating and several hundred are estimated.

Lipochaeta tenuis Deg. & Sherff

Found today from the higher, open, steep, rocky ridge towards Puu Kalena from Kolekole Pass. About 50 are known from one population. Var. *sellingii* Deg. & Sherff (*L. tenuis* Deg. & Sherff in *MFPH*).

Senecio sandvicensis Less.

Supposedly collected from O'ahu once by Eschscholtz. May be an early introduction. Characters do not differ from the alien *S. hydrophilus* Nutt. (*MFPH*).

Tetramolopium filiforme Sherff

Known from mid-level to high, dry, exposed rocky ridges from 'Ōhikilolo and Keeau of Wai'anae Range. Populations fluctuate from year to year based on rainfall. A hundred are known and regeneration is equated to the amount of rainfall. Regenerating, but threatened by alien plant aggression.

Tetramolopium lepidotum (Less.) Sherff

Known today from one population near Pu'u Kaua, Wai'anae Range. The Mauna Kapu and Pu'u Häpapa populations no longer exist. Presently over 50 are known from the several hundred of several years ago. This population threatened by alien plant aggression, especially molasses grass (*Melinis*). Regenerating but mortality rate seems higher.

Tetramolopium polyphyllum Sherff

Over 50 plants are known from beyond the summit of 'Ōhikilolo summit. (*T. filiforme* Sherff var. *polyphyllum* (Sherff) Lowrey in *MFPH*).

Tetramolopium tenerrimum (Less.) Nees

Collected in the 1800's from the Ko'olau Range. Extinct. Variety *luxurians* (Hbd.) Sherff (*T. tenerrimum* (Less.) Nees in *MFPH*).

CONVOLVULACEAE

Bonamia menziesii Gray
Principally an understory liana from the drier lowlands and mid-elevation forests of both ranges. Regenerating and prolific under cultivation. Over 50 are known.

Cressa insularis House (Cressa truxillensis Kunth in MFPH).
An indigenous mudflat and shoreline taxon unknown from O'ahu in recent years.

CRUCIFERAE (Brassicaceae)

Lepidium arbuscula Hbd.
Recently a few plants have been observed from the dry, mid-elevation Kuoakala and Nänäkuli areas of leeward Wai'anae Range. Very rare.

Lepidium bidentatum Mont. var. o-waihiense (C. & S.) Fosb. (L. bidentatum Mont. in MFPH).
Three coastal populations are known. The Makapu'u population is largest and numbers a few hundred. The other two barely existing. A small population was recently found high above Camp Erdman area along the base of a rocky cliff face.

CUCURBITACEAE

Sicyos laysanensis St. John (Sicyos pachycarpus Hook. & Arnott in MFPH).
The latter is quite common along lowland and coastal leeward and northern windward Wai'anae Range.

Sicyos maximowiczii Cogn. "Pua-o-Kama"
Extinct from O'ahu.

Sicyos pachycarpus H. & A. "Kūpala, paha" (Presently without an epithet in MFPH).
Crudely put, the type sheet was represented by a specimen of S. microcarpus and S. pachycarpus. Unfortunately the S. microcarpus specimen was given the S. pachycarpus description. Thus the S. pachycarpus epithet is retained for the S. microcarpus specimen (MFPH). Now the former S. pachycarpus is without an epithet. The former S. microcarpus is a very common annual vine found mostly along leeward and northern windward lowland Wai'anae Range. The former S. pachycarpus is known today only from the mid-elevation dry forest of upper Mākaha Valley from an single population of 5 vines. Very rare. It is a short lived perennial.

Sicyos remyanus Cogn. (S. pachycarpus Hook. & Arnott in MFPH).
As the latter, a very common annual.

CUSCUTACEAE (Convolvulaceae)

*Cuscuta sandwichiana Choisy "Kauna'oa"
A depleted parasitic coastal liana and a few populations are known today. Being depleted by lei makers.

CYPERACEAE

Cyperus
Genus evaluation omitted due in part to unfamiliarity and unresolved taxamony.

Gahnia globosa Mann
Known from the canopied, drier, higher elevations of the Wai'anae Range to the higher wet Ko'olau rain forests and summits, but not collected from the Ko'olau's in recent years. Population status unknown and possibly rare.

Carex pluvia Krauss var. koolauensis Krauss (Carex alligata Bott in MFPH).
Not collected in recent years. This variety was known from the wet middle elevations of central O'ahu. Was always rare.

EUPHORBIACEAE

Antidesma pulvinatum Hbd. var. leiogonum Sherff (Antidesma platyphyllum H. Mann in MFPH).
As the latter, common.

Claoxylon sandwicense Muell-Arg. var. glabrescens (Sherff) Sherff (C. sandwicense Muell-Arg in MFPH).
No varieties recognized from this taxon. Very common. May be considered rare in its habitat from time to time as this fairly short lived taxon dies off frequently. Die off seems to be a simultaneous occurance.

Drypetes phyllanthoides (Rock) Sherff "Mēhamehame'" (Flueggea neowawraea W. Hayden in MFPH).
Known mostly from the mid-elevation drier forests of leeward and northern windward Wai'anae Range. Few are known from windward central and southern Wai'anae Range. About 50 trees are known. Seldom regenerates. Endangered by constant attacks of black twig borers (Xylsandrus compactus Eichhoff). An uncommon tree, the largest having a diameter of 2 meters (6 ft.).

Euphorbia
Aside from Euphorbia haeleeleana, all other native Euphorbia are treated as Chamaesvce (MFPH).

Euphorbia arnottiana Endl. "Akoko, koko" (Chamaesyce arnottiana (Endl.) Degener & I. Degener in MFPH).
Known from drier mid-elevation forest understory of leeward southern Ko'olau Range (Manoa to Niu). Rather common and numbers about 500.

Euphorbia celastroides Boiss. var. *kaenana* Sherff "Akoko" (*Chamaesyce celastroides* (Boiss.) var. *kaenana* (Sherff) Degener & I Degener in *MFPH*). Known generally as a coastal form from both sides of Ka'ena Point, but also inhabits higher cliff faces beyond Ka'ena Point. Over 200 known and not as rare as depicted by some.

Euphorbia celastroides Boiss. var. *niuensis* Sherff (*Chamaesyce celastroides* (Boiss.) Croizat & Degener in *MFPH*). As the latter common.

Euphorbia degeneri Sherff (*Chamaesyce degeneri* (Sherff) Croizat & Degener in *MFPH*). A widespread coastal as well as dry low-elevation taxon. Several hundred are scattered mostly in leeward areas.

Euphorbia deppeana Boiss. (*Chamaesyce deppeana* (Boiss.) Millsp.) Considered extinct, but recently refound around Nu'uanu Pali. Few plants are known. Rare.

Euphorbia forbesii Sherff (*Chamaesyce herbstii* W. L. Wagner. Comb. nov.). Quite recently, the largest Makaleha population was almost extirpated by a landslide. Other populations known from Makaleha, Pahole and 'Ekahanui Gulches of Wai'anae Range. Population depleted and over 50 matured plants are known today. Some regeneration noted.

Euphorbia haeleeleana Herbst
Only true native *Euphorbia* known. Recently discovered from steep, dry slopes of Kaluakauila Gulch, Wai'anae Range. Two populations of about 70 matured trees are known.

Euphorbia hillebrandii Levl. var. *palikeana* Deg. & Sherff and var. *waimanoana* Sherff (*Chamaesyce multiformis* (Hook. & Arnott) Croizat & Degener in *MFPH*). As the last, common.

Euphorbia kuwaleana Deg. & Sherff (*Chamaesyce kuwaleana* (Degener & Sherff) Degener & I. Degener in *MFPH*). Known today from two peaks of Kaua'ōpu'u between Wai'anae and Lualualei. Over 300 known. Resembles an ecotype of *C. degeneri*.

Euphorbia multiformis H. & A. var. *kaalana* Sherff (*C. celestroides* (Boiss.) Croizat & Degener in *MFPH*). As the latter, very common.

Euphorbia multiformis H. & A. var. *multiformis* (*Chamaesyce multiformis* (Hook. & Arnott) Croizat & Degener in *MFPH*). Common

Euphorbia multiformis H. & A. var. *perdita* Sherff (*C. multiformis* (Hook. & Arnott) Croizat & Degener in *MFPH*). var. *tomentella* Boiss. (*S. celastroides* (Boiss.) Croizat & Degener var. *tomentella* (Boiss.) Koutnik in *MFPH*. The latter probably extinct from O'ahu in (*MFPH*).

Euphorbia skottsbergii Sherff var. *kalaeloana* Sherff (*Chamaesyce skottsbergii* (Sherff) Croizat & Degener in *MFPH*). A very depleted taxon from a very restricted population around Campbell Harbor. Today less than 20 plants are barely surviving the ravages of construction debris and mealbug infestations. Very rare and in danger of extinction. Legally endangered. Cultivated.

Phyllanthus sandwicensis Muell-Arg. var. *elliptica* Muell.-Arg. (*P. distichus* Hook. & Arnott in *MFPH*). As the latter common in drier middle elevation forest understory.

FLAGELLARIACEAE

Joinvillea ascendens Gaud. ex Brongn. & Gris. "Ohe" A rare, widely dispersed taxon found in the understory of mid-elevation drier and wet forests of both ranges. Twenty years ago this taxon was encountered quite frequently, but today less than 10 are known. Rare on O'ahu. Easily cultivated in greenhouse conditions, but does not survive when planted in the ground. No regeneration in nature.

GENTIANACEAE

Centaurium sebaeoides (Gris.) Druce "Awiwi" A small population was noted near sea level near Manini Gulch pasture land fifteen years ago. Behaves as an annual. Not seen since on O'ahu.

GESNERIACEAE

Cyrtandra, in the field, seemingly encompasses many variable species and apparent hybrid combinations. In their assesment Fosberg-Herbst listed 93 taxa without considering any combinations. *MFPH* assigned 80 of the 93 taxa listed into synonomy or supposed hybrid combinations. A paper on this subject is forthcoming in the near future. Only 13 taxa will be discussed in this analysis. The remaining 80 will be given only the synonym or hybrid combinations thus facilitating assessment.

Cyrtandra alata St. John & Storey (*C. hawaiiensis* x *C. laxiflora* in *MFPH*).

Cyrtandra alnea St. John (*C. paludosa* hybrid in *MFPH*).

Cyrtandra ambigua (Hbd.) St. John & Storey (*C. paludosa* x *C. polyantha* in *MFPH*).

Cyrtandra arcuata St. John (C. kalihii x C. lessoniana MFPH).

Cyrtandra atomigyna St. John & Storey (S. hawaiensis x C. kalihii in MFPH).

Cyrtandra axilliflora St. John & Storey (S. kalihii x C. subumbellata in MFPH).

Cyrtandra basipartita St. John (C. kalihii x C. propinqua in MFPH).

Cyrtandra brevicornuta St. John (C. hawaiiensis C. B. Clark in MFPH).
As the latter, widespread in both ranges. Inhabiting mid elevation moist forest. Not rare.

Cyrtandra bryanii St. John & Storey (C. lessoniana Gaud. in MFPH).

Cyrtandra campaniformis St. John (C. laxiflora H. Mann in MFPH).

Cyrtandra carinata St. John & Storey (C. cordifolia x C. lessoniana in MFPH).

Cyrtandra caudatisepala St. John (C. calpidicarpa x C. propinqua in MFPH).

Cyrtandra chartacea St. John & Storey (C. kalihii x C. laxiflora in MFPH).

Cyrtandra christopherseni St. John & Storey (C garnotiana x C. waianaeensis in MFPH).

Cyrtandra collarifera St. John & Storey (C. kalihii Wawra in MFPH).
As the latter, widespread over wet mid-elevation forest of both ranges.

Cyrtandra cordifolia Gaud. var. brevipilita St. John (C. cordifolia Gaud MFPH). Common.

Cyrtandra cornuta St. John (C. calpidicarpa (Rock) St. John & Storey in MFPH).
As the latter, common.

Cyrtandra crassior St. John & Storey (C. cordifolia x C. rivularis in MFPH).
As the latter, fairly common.

Cyrtandra crenata St. John & Storey
Collected in the past from the Waikāne-Kahana area, southern Wai'anae Range (windward) and central Ko'olau Range. Last collected in 1934. Status unknown today and considered very rare.

Cyrtandra cupuliformis St. John & Storey (C. garnotiana x C. lessoniana in MFPH).

Cyrtandra dentata St. John & Storey (C. garnotiana x C. lessoniana in MFPH).
Known from the mid-elevation forest understory of both ranges and encountered infrequently. Not considered rare.

Cyrtandra ellipticifolia St. John (C. paludosa x C. propinqua in MFPH).

Cyrtandra elliptisepala St. John (C. lessoniana Gaud. in MFPH).

Cyrtandra ferricolorata St. John & Storey (C. hawaiiensis x C. propinqua in MFPH).

Cyrtandra ferruginosa St. John & Storey (C. cordifolia x C. grandiflora in MFPH).

Cyrtandra forbesii St. John & Storey (C. hawaiiensis x C. laxiflora in MFPH).

Cyrtandra fosbergii St. John & Storey (C. hawaiiensis x C. kalihii in MFPH).

Cyrtandra frederickii St. John & Storey (C. dentata St. John & Storey in MFPH).

Cyrtandra fusiformis St. John & Storey (C. hawaiiensis C. B. Clarke in MFPH).
As the latter, widesrpead from both ranges.

Cyrtandra garberi St. John (C. paludosa Gaud. in MFPH).
As the latter, common.

Cyrtandra gracilis Hbd.
Known only from the type description of 1883 from Pālolo. Was collected from Pālolo and Kōnāhuanui areas. Probably extinct today. The Kōnāhuanui form was known as C. linearis, but reduced to synonomy of above (MFPH).

Cyrtandra grossecrenata St. John & Storey (C. garnotiana x C. paludosa in MFPH).

Cyrtandra hirsutula St. John & Storey (C. lessoniana Gaud. in MFPH).

Cyrtandra honoluluensis Wawra (C. cordifolia x C. sandwicensis in MFPH).

Cyrtandra hosakae St. John & Storey (C. lessoniana x C. paludosa in MFPH).

Cyrtandra hyperdasa St. John (C. paludosa Gaud. in MFPH).

Cyrtandra infrapallida St. John (C. laxiflora H. Mann in MFPH).

Cyrtandra intonsa St. John & Storey (C. garnotiana Gaud. in MFPH). Common.

Cyrtandra intrapilosa St. John (C. lessoniana Gaud. in MFPH).

Cyrtandra intravillosa St. John & Storey (C. lessoniana Gaud. in MFPH).

Cyrtandra kaalae St. John & Storey (C. kalihii x C. lessoniana in MFPH).

Cyrtandra kahanaensis St. John & Storey (C. garnotiana x C. subumbellata in MFPH).

Cyrtandra kahukuensis St. John & Storey (C. paludosa x C. propinqua in MFPH).

Cyrtandra kaluanuiensis St. John (C. kalihii x C. laxiflora in MFPH).

Cyrtandra kaneoheensis St. John (C. kalihii x C. laxiflora in MFPH).

Cyrtandra kaulantha St. John & Storey
Known from Kahana and Waihole and along the ditch trail, locally common. Regenerating.

Cyrtandra kipapaensis St. John & Storey (C. cordifolia x C. laxiflora in MFPH).

Cyrtandra koolauensis St. John & Storey (C. lessoniana x C. paludosa in MFPH).

Cyrtandra laevis St. John (C. cordifolia x C. paludosa in MFPH).

Cyrtandra laxiflora Mann (No varieties recognized in MFPH).
A mid-elevation fairly widespread gully form. A confusing taxon found from the windward northern and central Ko'olau's.

Cyrtandra lessoniana Gaud. Listed varieties: *angustifolia* Hbd. & *intrapubens* St. John. Neither varieties recognized (*MFPH*). This is a widespread taxon and common.

Cyrtandra linearis St. John (*C. gracilis* Hillebr. ex C. B. Clark in *MFPH*).

Cyrtandra longicalyx St. John (*C. laxiflora* H. Mann in *MFPH*).

Cyrtandra longiloba St. John (*C. lessoniana* Guad. in *MFPH*).

Cyrtandra mannii St. John & Storey (*C. lessoniana* x *C. waianaeensis* in *MFPH*).

Cyrtandra niuensis St. John (*C. lessoniana* Gaud. in *MFPH*).

Cyrtandra nubicolens St. John (*C. paludosa* Gaud. in *MFPH*). As the latter, common.

Cyrtandra oblanceolata St. John (*C. hawaiiensis* C. B. Clarke in *MFPH*). As the latter, widespread through both ranges.

Cyrtandra olivacea St. John (*C. lessoniana* x *C. paludosa* in *MFPH*).

Cyrtandra oulophylla St. John (*s. cordifolia* x *C. lessoniana* in *MFPH*).

Cyrtandra paloloensis St. John & Storey (*C. cordifolia* x *C. grandiflora* in *MFPH*).

Cyrtandra partita St. John (*C. kalihii* x *C. propinqua* in *MFPH*).

Cyrtandra pearsallii St. John (*C. cordifolia* x *C. laxiflora* in *MFPH*).

Cyrtandra perstaminodica St. John (*C. hawaiiensis* C. B. Clarke in *MFPH*). As the latter, widespread over both ranges.

Cyrtandra pickeringii Gray A Kaua'i species. Only the type was supposedly collected from O'ahu. Otherwise unknown from O'ahu (*MFPH*).

Cyrtandra piligyna St. John & Storey (*C. cordifolia* x *C. sandwicensis* in *MFPH*).

Cyrtandra plurifolia St. John (*C. paludosa* x *C. propinqua* in *MFPH*).

Cyrtandra poamohoensis St. John (C. cordifolia x C. lessoniana in MFPH).

Cyrtandra polyantha C. B. Cl.
A rare taxon known from Niu to Maunalua at the middle to higher elevations. Not collected in 25 years.

Cyrtandra pruinosa St. John & Storey
Known only from Storey's collection off the 'Aiea trail in 1933. Was known from leeward central O'ahu. Probably extinct today.

Cyrtandra pubens St. John (C. cordifolia x C. kalihii in MFPH).

Cyrtandra pupukeaensis St. John (C. paludosa x C. propinqua in MFPH).

Cyrtandra rockii St. John & Storey (C. paludosa x C. propinqua in MFPH).

Cyrtandra sandwicensis (Levl.) St. John & Storey
This taxon was known from Nu'uanu to Pālolo and is quite depleted today. Known today from a few populations on Tantalus.

Cyrtandra scabrella C. B. Cl. (C. kalihii x C. paludosa in MFPH).

Cyrtandra skottsbergii St. John & Storey (C. cordifolia x C. garnotiana in MFPH).

Cyrtandra subcordata St. John (C. cordifolia x C. garnotiana in MFPH).

Cyrtandra subintegra St. John (C. grandiflora x C. lessoniana in MFPH).

Cyrtandra subrecta St. John (C. hawaiiensis C. B. Clarke in MFPH).
As the latter, widespread over both ranges in wet mid-elevation forests.

Cyrtandra subumbellata (Hillebr.) St. John & Storey var. intonsa St. John (C. subumbellata (Hillebr.) St. John & Storey in MFPH).
As a species rare from Kahana.

Cyrtandra ternata St. John (C. hawaiiensis x C. kalihii in MFPH).

Cyrtandra triflora Gaud. (C. polyantha C. B. Clarke in MFPH).

Cyrtandra turbiniformis St. John & Storey (*C. grandiflora* x *C. laxiflora* in *MFPH*).

Cyrtandra vanioti Levl. (*C. polyantha* C. B. Clarke in *MFPH*).

Cyrtandra villicalyx St. John & Storey (*C. cordifolia* x *C. propinqua* in *MFPH*).

Cyrtandra villicalyx St. John & Storey var. *pubentigyna* St. John & Storey (synonym above) in *MFPH*.

Cyrtandra villosa St. John & Storey (*C. rivularis* St. John & Storey in *MFPH*).
As the latter, uncommon from the wet mid-northern Ko'olau's.

Cyrtandra villosiflora St. John (*C. cordifolia* x *C. garnotiana* in *MFPH*).

Cyrtandra viridiflora St. John
Was known from the summits of Punalu'u to Lanihuli. Today one population of several plants is known from Lanihuli. Rare.

Cyrtandra waianuensis Rock (*C. hawaiiensis* C. B. Clarke in *MFPH*).
As the latter, widespread in wet mid-elevation forests of both ranges.

Cyrtandra waiolani Wawra
Was known from Hālawa to Kalihi. Aside from one collection in the 1940's, all other collections are from over 50 years ago. Also known from the windward areas, but if in existence, very rare. Var. *capitata* Hbd. reduced to synonymy (*MFPH*).

Cyrtandra waiomaoensis St. John (*C. hawaiiensis* C. B. Clarke in *MFPH*).
As the latter, widespread in wet mid-elevation forests of both ranges.

GOODENIACEAE

Scaevola coriacea Nutt.
Was known on O'ahu about 50 years ago from northern leeward O'ahu. Extinct from O'ahu today.

Scaevola gaudichaudii H. & A. "Naupaka kuahiwi"
A middle elevation dryland taxon known today from one small population in Niu and a large population from Kuoakalaa. Over 200 plants are known and the Wai'anae population is regenerating.

Scaevola skottsbergii St. John (S. gaudichaudiana Cham. in MFPH). Common as the latter.

GRAMINEAE

Cenchrus agrimonioides Trin.
Scattered today along the mid-elevation levels mostly of northern windward and northern leeward Wai'anae Range. Over 50 have been observed.

Cenchrus pedunculatus Deg. & Whitney (Cenchrus agrimonioides Trin. in MFPH).
Known today from the drier mid-elevation understory of windward northern and leeward southern Wai'anae Range. Over 25 have been documented. This heavier form is rare.

Dissochondrus biflorus (Hbd.) O. Ktze. ex Hack.
Known today from the drier, forested mid-elevation and higher understory of the Wai'anae Range. It is abundant in some populations and over 200 are known.

Eragrostis fosbergii Whitney
A very rare grass known apparently from the original collection only along the high, dry, rocky slopes of Mt. Ka'ala. Little is known about it.

Eragrotis paupera Jedw.
Apparently extinct and was early collected around Barbers Point.

Panicum carteri Hosaka (P. fauriei Hitchc. var. carteri (Hosaka) Davidse in MFPH).
Known from a very restricted population on an off-shore islet today. Being an annual, its status is difficult to assess. Very rare and legally endangered.

Panicum havaiense Reich. "Konakona" (P. nephelophilum Gaud. in MFPH).
Common along mid-elevation forested zones of Wai'anae Range.

Panicum koolauense (Krajina) St. John & Hosaka (Dichanthelium koolauense (St. John & Hosaka) C. A. Clark & Gould in MFPH).
Known mostly from the misty, wind-swept summit areas of northern and central Ko'olau Range. This taxon grows in clumps and was fairly common along the summits a few years ago, but currently depleted by activities of feral pigs and alien plant invasion of its habitat. Still locally common.

HALORAGACEAE (Gunneraceae)

Gunnera kaalensis (Krajina) St. John "Ape" (G. petaloides Gaud. in MFPH).
Known from the high, misty, perimeter slopes of Ka'ala and Pu'u Kālena. Older populations seem large from a distance

because of its multiple stem habits, but in reality only a few or individual specimen may occur. Realistically less than 50 plants are scattered in several populations. Recent surveys of Kōnāhuanui area did not yield the other population.

Gunnera makahaensis St. John (G. petaloides Gaud. MFPH).
See above.

HYDROPHYLIACEAE

Nama sandwicensis A. Gray
Over 50 plants are known from several fragile coastal populations. Threatened by human coastal activities.

HYMENOPHYLLACEAE

Trichomanes (Vandenboschia) draytonianum Brack.
Seems to inhabit shady, moist gully floors and stream banks on rough, wet boulders and rock faces. Not as rare as thought to be.

JUNCACEAE

Luzula hawaiiensis Buch. var. oahuensis (Deg. & Fosb.) Deg. & I. Deg.
A common species along the summit areas from Pu'u Hapapa to Mauna Kapu. Depleted during dry seasons and rejuvenates in abundance after a series of rain. May number 1,000.

LABIATAE (Lamiaceae)

Phyllostegia glabra (Gaud.) Benth.
This taxon was fairly common 20 years ago, but is relatively uncommon on both ranges today. Few populations are scattered from the misty ridge tops to mid-elevation moist gulches. Var. macraei (Benth.) Sherff: Status unknown.

Phyllostegia hirsuta Benth.
One population of about 15 plants is known from a mid-elevation talus slope of Kalua'a Gulch, Wai'anae Range. Regeneration threatened by oncoming alien vegetation. Rare.

Phyllostegia parviflora (Gaud.) Benth.
This taxon is known today from one localized population in Napepeioaulelo Gulch, southern Wai'anae Range. Locally abundant with over 50 plants and regenerating. Inhabits talus slopes.

Phyllostegia yamaguchii Hosaka & Deg. (P. glabra (Gaud.) Benth. x P. hirsuta Benth. MFPH).
Collected only once along summit area of Lāie. Has been a controversial taxon and considered a hybrid today (MFPH).

Stenogyne kaalae Wawra
Generally found in the understory of high ridgetop areas through most of the Wai'anae Range. Usually solitary or few

in number, but widespread and fairly common throughout its range.

Stenogyne kanehoana Deg. & Sherff
A very rare localized ridgetop taxon known today from three spreading liana in central windward Wai'anae Range. Has always been rare and rarely fruits. Would consider this taxon very endangered by its number and localization.

LAURACEAE

Cryptocarva oahuensis (Deg.) Fosb. (Cryptocarya mannii Hillebr. in MFPH).
Known today from only one tree, but was known from three populations several years ago. A mid-elevation near ridgetop taxon. Known only from Kalua'a Gulch today. Headed for extinction due to senescence.

LEGUMINOAE (Fabaceae)

Cassia gaudichaudii H. & A. "Kolamona" (Senna gaudichaudii (Hook. & Arnott) H. Irwin & Barneby in MFPH).
Found from low and mid-elevation dry forests of both ranges. Often an understory low shrub and considered common. Several hundred plants are known and regeneration is common.

Mezoneuron kavaiense (Mann) Hbd. "Uhiuhi" (Caesalpinia kavaiensis H. Mann in MFPH).
Known today from less than ten plants along dry, mid-elevation terrain of Wai'anae Range. Today most plants are found in the windward northern Wai'anae's. Regeneration common, but seedlings seldom survive. Very rare today as populations are depleted to less than 10.

Sesbania tomentosa H. & A.
A coastal form of about 30 plants found only from the Ka'ena Point area. Threatened by human activities. Naturally the population has been fairly stable for the last 30 years.

Sophora chrysophylla (Salisb.) Seem. "Māmane"
Ovr 100 plants known from drier, mid-elevation populations of leeward, windward central and southern Wai'anae Range. Regenerating, but not vigorous. Perhaps lacks altitude. None of the many varieties are recognized (MFPH).

Tephrosia piscatoria Pers. "Auhuhu"
Known today on O'ahu from one population of few plants on a windward offshore islet. Ocasionally rumored along coastal areas. Short lived and rare on O'ahu.

Vigna o-wahuensis Vogel
A lowland taxon formerly known from Lanikai to Waimānalo, but not collected since the 1930's. May be extinct.

Vigna sandwicensis A. Gray (*V. o-wahuensis* Vogel in *MFPH*). See above.

LILIACEAE

Astelia veratroides Gaud. "Pa'iniu" (*A. menziesiana* Sm. in *MFPH*). Many populations are known from wet and drier summit areas of both ranges. The epiphytic silvery, summit Central Ko'olau Range forms are unknown today. Large populations are known from Pu'u Hāpapa and Pu'u Kaua and also from the summits of windward southern Ko'olau. Several hundred are estimated.

Pleomele forbesii Deg. "Halapepe" Generally known from northern windward and leeward Wai'anae Range. Ocasionally noted in southern Wai'anae Range. Population depleted, less than 50 plants. However, differentiating *P. halapepe*, the wider leafed taxon, from *P. forbesii*, the narrow leafed taxon, is not easy.

Smilax melastomifolia Sm. "Hoi kuahiwi" A synonym of *Smilax sandwicensis* Kunth (*MFPH*), but the former epithet predates the latter (*MFPH*). A Wai'anae Range form with fine "spines" on only mature stems. Found in mid-elevation forests of the windward southern Wai'anae Range. This "spiny" form is uncommon. *SMILACACEAE* (*MFPH*).

LOGANIACEAE

Labordia decurrens Sherff Reduced to the common *L. tinifolia* (A. Gray) Conn. (*MFPH*).

Labordia fagraeoides Guad. Considered fairly common and ranges from the wet higher elevations to the summits of the Ko'olau Range. Variety *jugorum* Sherff not recognized (*MFPH*). Varieties *hillebrandii* Sherff, *longisepala* Sherff, *multisepala* Sherff, *saint-johniana* Sherff, *waianaeana* Sherff reduced to *Labordia waiolani* Wawra (*MFPH*). As *L. waiolani* fairly common on the misty windblown summits.

Labordia glabra Hbd. (*Labordia hedyosmifolia* Baill. in *MFPH*). As the latter fairly common.

Labordia glabra Hbd. var. *latisepala* Sherff (*L. hosakana* (Sherff) W. L. Wagner, Herbst & Sohmer in *MFPH*). Under the latter epithet, fairly common from Kipapa to Mt. Olympus.

Labordia hedyosmifolia Baill. var. *hosakana* Sherff (*L. hosakana* (Sherff) W. L. Wagner, Herbst & Sohmer in *MFPH*). Fairly common along the misty, windy windward face of the summit areas of central Ko'olau Range.

Labordia hymenopoda Deg. & Sherff (Labordia sessilis A. Gray in MFPH).
A confusing taxon known from the higher elevations to the misty summits of the Ko'olau Range. Locally common in spots.

Labordia kaalae Forbes
A widespread but uncommon taxon known mostly from drier to wet summit ridge tops and high gullies of Wai'anae Range. Less than 50 plants are known.

Labordia membranacea Mann var. exiqua Mann (L. hirtella H. Mann in MFPH).
Uncommon. See below.

Labordia olympiana Sherff (L. hirtella H. Mann in MFPH).
L. hirtella is scattered throughout the forested higher areas of south-central Ko'olau Range. Uncommon but not rare.

Labordia tinifolia Gray Varieties honoluluensis Sherff & leptantha Sherff not recognized (MFPH).
Fairly common species in the forested mid-elevation and higher somewhat drier habitat.

LORANTHACEAE (Viscaceae - MFPH)

Korthalsella "Hulumoa"
Today each taxon generally seems host specific or associated with a few different species. Exhibits considerable range of variability especially when parasitizing different host species. Life span seems rather short (several years).

Korthalsella cylindrica (v. Tiegh) Engler var. teres (Wawra) St. John (K. cylindrica (Tiegh.) Engl. in MFPH).
This fairly common taxon usually parasitizes Metrosideros today. It is quite variable and the variety teres is known only from the original collection.

Korthalsella degeneri Danser
Known only from the original Mākua Valley habitat at the base of the Piko trail which has been burnt over several times in recent years. Its hosts were Sapindus & Osmanthus and its taxonomy is confusing. Probably extinct.

Korthalsella latissima (v. Tiegh.) Danser var. crassa (v. Tiegh.) Danser (Korthalsella latissima (v. Tiegh.) Danser in MFPH).
Today Myrsine sandwicensis seems to be its host. They are not long-lived so populations fluctuate. At least 50 are known.

Korthalsella remyana v. Tiegh.
Most commonly associated with Diospyros in the drier middle elevations. Most concentrated around the Niu area and

numbers less than 30.

Korthalsella remyi (v. Tiegh.) Skottsb. (K. complanata (v. Tiegh.) Engl. in MFPH).
As a synonym, K. complanata, rather common.

LYCOPODIACEAE

None of the taxa listed in Fosberg-Herbst are found on O'ahu. Based on current field observations, four of the rarer taxa will be discussed.

*Lycopodium erubescens Brack. (Huperzia erubescens (Brackenr. in Wilkes) Holub, in ed.)
Two small populations were noted in 1985 from the summit areas of 'Aiea and Waikane trails along exposed, disturbed, wind blown, wet habitats. Less than 15 plants were noted then. Was virtually unknown from O'ahu. W. H. Wagner considers this taxon a hybrid. In 1987 none were seen.

*Lycopodium nutans Brack.
Several collections were made in the 1930's from north-central Ko'olau's. Last collected on the Manoa Cliff trail by R. Fosberg in 1936. Not seen since.

*Lycopodium polytrichoides Kaulf.
On O'ahu known mostly from mid-elevation central Ko'olau Range in the past. One was even observed in mid-elevation southern windward Wai'anae Range. Hardly any observations are noted in the past ten years on O'ahu. Has always been rare.

*Lycopodium venustulum Guad.
A rarer taxon on O'ahu and known today from one healthy population in a clearing from the summit of Mt. Ka'ala.

MALVACEAE

Abutilon sandwicense (Deg.) Christoph.
A widespread taxon known from canopied mid-elevation summer dry slopes and gully floor. Found along the eastern half of windward and entire length of leeward Wai'anae Range. Totals over 200 and locally very common. Regenerating. Var. welchii Christ. reduced to the species (MFPH). Cultivated.

Gossypium tomentosa Nutt. (Ma'o)
A coastal taxon known today from populations in northwestern and leeward southern Wai'anae Range plus leeward southern O'ahu. All populations depleted. A taxon that thrives with disturbance. Less than 50 plants exist today. Cultivated. Being endangered by development.

Hibiscus brackenridgei Gray var. *mokuleiana* Roe "Ma'o hau hele" (*H. brackenridgei* A. Gray in *MFPH*).
Known today from one population on a cliff face from windward northwestern Wai'anae Range. About 25 plants exist. Unfortunately this taxon is short lived, about five years, and is dependent on constant regeneration for survival. The Mokulē'ia population no longer exists today. Status in flux. Very rare.

Hibiscus kokio Hbd. ex Wawra "Koki'o"
Known from a talus rock, *Sapindus*-*Aleurites* understory in low elevation windward Northwestern Wai'anae Range. One plant and several apparent runners make up this prostrate population. One remaining plant from the Kawaikï population apparently was artificially propagated. Very rare on O'ahu.

Kokio lanceolata Lewt.
Was known from Wailupe to Koko Head, but not seen in this century. Extinct.

MARSILEACEAE

Marsilea villosa Kaulf.
Known today from two coastal populations near Hanauma Bay and Lualualei. Both populations healthy, but may be endangered by human activities.

MORACEAE

Pseudomorus brunoniana (Endl.) Bur., var. *sandwicensis* (Deg.) Skottsb. "A' ia'i" (*Streblus pendulinus* (Endl.) F. v. Muell. in *MFPH*).
Few or solitary plants scattered through the drier mid-elevation forest especially of Wai'anae Range. Estimated population of 30 plants.

MYRSINACEAE

Embelia pacifica Hbd. "Kilioe"
A rarer liana scattered from mid-elevation drier forests to wet summit ridges of both ranges. Less than 20 observed.

Myrsine juddii Hosaka
Known from northern central Ko'olau summit ridge tops. Several populations are known and about 100 is estimated.

Myrsine lanaiensis Hbd. var. *oahuensis* Hosaka (*Myrsine lanaiensis* Hillebr. *MFPH*).
Usually found in a solitary state and very depleted today. A mid-elevation ridge top taxon and rather rare on O'ahu.

Myrsine meziana (Levl.) Wilbur var. *fosbergii* (Hosaka) Wilber (*Myrsine fosbergii* Hosaka in *MFPH*).
Summit ridgetop taxon known from the northern Ko'olau's to Kuli'ou'ou. Scattered in small numbers throughout its range

and nearly 100 are known.

Eugenia koolauensis Deg. "Nīoi"
A rare, little-known taxon from lower to mid-elevation open dry forests. Has been observed in recent years from a few populations in northern Ko'olau Range. Known in the past from the Opaeula area.

Eugenia reinwardtiana (Blume) DC. "Nīoi"
A mid-elevation dry forest, understory taxon rare in the Ko'olau Range, but found throughout the Wai'anae Range. Common in the Mokulē'ia Forest Reserve. Two hundred are estimated.

NYCTAGINACEAE

Boerhavia diffusa L. "Alena" (B. glabrata Blume in MFPH). var. gymnocarpa Heim. and var. sandwicensis Heim. "Alena" (B. repens L. in MFPH).
The last two generally away from the coastal zone and very common.

Pisonia brunoniana Endl. "Pāpala kēpau"
Generally inhabits the drier mid-elevation gulches and locally may be quite common in some habitats.

Pisonia sandwicensis Hbd. "Āulu"
A common species of the mid-elevation gulches of both ranges. Viable and regenerating and locally abundant.

OPHIOGLOSSACEAE

Botrychium subbifoliatum Brack.
Last collected in Pālolo Valley in the 1930's and was not considered rare. Not seen since. Presumed extinct.

ORCHIDACEAE

Anoectochilus sandwicensis Lindl.
Known today from the misty summit areas of both ranges. Populations tend to be colonial when found. Generally found growing in moss and filmy liverwort under Metrosideros cover. Heavy populations are north of Poamoho summit and south of Mt. Ka'ala. Several hundred have been seen. Fairly common.

Habenaria holochila Hbd. (Platanthera holochila (Hillebr.) Kranzl. in MFPH).
Last collected on O'ahu in the early 1940's. Has not been seen since. Was known along the summit areas from Lāie to Kipapa. Extremely rare but hopefully not extinct.

Liparis hawaiiensis Mann "Awapuhi a Kanaloa"
Was known in the past from mid-elevation to summit dry as well as wet forests as an epiphyte or terrestrial. Rarely seen in the Ko'olau's today, but known from drier and wet

summit areas of Ka'ala and southern Wai'anae Range. Less than 15 have been observed in recent years as terrestrials.

PALMAE (Arecaceae)

Pritchardia "Loulu"
Only two species are recognized from O'ahu (MFPH). All Ko'olau range species reduced to P. martii (Gaud.) H. A. Wendl. in MFPH. Three plants near Palikea, southern Wai'anae also share this epithet. Pritchardia kahanae Rock & Caum, P. macdanielsii Caum and P. rockiana Becc. are synonyms of P. martii (MFPH). Pritchardia macrocarpa Linden ex Andre is known only from the cultivated holotype type plant of dubious origin. Other plants from its so-called type area do not display its critical characters. This taxon omitted.

Pritchardia kaalae Rock "Loulu"
Known from mid-elevation gulches and high slopes of Mokulē'ia Forest Reserve. Over 40 are scattered in several small populations. Variety minima is known from the mid-elevation and 'Ōhikilolo summit area plus the cliff faces of upper northern Mākaha Valley. About 70 known, but variety not recognized (MFPH).

Pritchardia martii (Gaud.) H. A. Wendl. "Loulu"
Known from 500 m (1650 ft) to summit areas throughout the Ko'olau Range. Presently common, estimated at about 5,000. Twenty years ago the estimate was 10,000. Depleted and regeneration rates greatly reduced. A recently observed form from windward southern Wai'anae Range and Kuli'ou'ou seem different from P. martii. Its stature is short, unlike P. martii, with inflorescence extending far beyond the frond as in P. kaalae and fruits consistently half the size or smaller than any P. martii. Its tomentose frond is similar to the latter. Known from 3 plants in southern Wai'anae Range and about 20 in Kuli'ou'ou.

PHYTOLACCACEAE

*Phytolacca sandwicensis Endl. "Pōpolo"
A few plants are known from the summit area and environs of Palikea, Wai'anae Range. Taxonomically confusing. Same plants may revert in character from P. sandwicensis to the alien P. octandra with seasonal changes. Two distinct forms may be noted in the same population. Rare on O'ahu.

PIPERACEAE

The genus Peperomia is greatly depleted today except for the two indigenous species, P. tetraphylla and P. leptostachya and the endemic P. paludosa. Some species may be fairly abundant in small pockets, but about 80-90 percent of the population in existence twenty years ago are no longer known. Many of the summit Ko'olau forms are rarer today due in part to the depletion of Metrosideros and moss cover with alien grass and Clidemia invasions.

Peperomia dextrilaeva St. John (P. oahuensis C. DC. in MFPH). A species belonging to a very variable complex of the genus and was quite common in the past from the higher elevation to the crest of the Ko'olau Range, but extremely depleted today. Uncommon.

Peperomia hypoleuca Meg. var. pluvigaudens (C. DC.) Yunker Variety reduced to the species (MFPH) but this species now unknown from O'ahu.

Peperomia kalihiana Yuncker (P. macraeana C. DC. in MFPH) A species known from the higher elevation wet forest. Very depleted today but not rare.

Peperomia oahuensis C. DC. var. st.-johnii Yuncker A localized variety from the Ko'olau Range, but reduced to the species (MFPH). The species is very depleted today.

PITTOSPORACEAE

The genus Pittosporum in Hawai'i is poorly understood and defined by three extremes in treatment (Sherff, Haas, St. John), the last two quite recent. The taxonomy generally is based on fruit and leaf characters which are quite variable. Field assessment is further complicated by these superficially based characters.

Pittosporum cauliflorum Mann "Hō'awa" (P. confertiflorum A. Gray in MFPH).
On O'ahu it is a polymorphic and second most encountered species of Pittosporum. A mid-elevation to high ridgetop form from the drier to misty summits. Common, perhaps a few hundred.

Pittosporum glabrum H. & A. "Hō'awa"
A very variable taxon and the most common taxon of pittosporum on O'ahu. Ranges from drier mid-elevation areas to the wet summits and displays an array of ecotypes. Very common and numbers in the multiple hundreds. No varieties are recognized (MFPH).

Pittosporum kahananum Sherff (P. glabrum Hook. & Arnott in MFPH).
See under P. glabrum.

Pittosporum sulcatum var. rumicifolium Sherff (P. glabrum Hook. & Arnott in MFPH).
See under P. glabrum.

PLANTAGINACEAE

Plantago grayana Pilger "Manene" (P. pachyphylla A. Gray in

MFPH).
As the latter, a common Ko'olau summit form.

Plantago princeps Cham. & Schlechlend. "Laukāhi"
Six varieties are listed from O'ahu, but only one, P. princeps C. & S. var. anomala Rock, is known today and was rediscovered in early 1987 from Napepeiauolelo Gulch in southern Wai'anae Range. The other five varieties are unknown and probably extinct. This variety is restricted to a steep, dry, cliff face and 12 plants are known from this fragile population. Vegetatively resembles a Dubautia laxa. Very rare.

POLYPODIACEAE

Adenophorus periens Bishop
Was last seen from along the banks of Kaluanui Stream at mid-elevation over 30 years ago. Very rare and its habitat is overrun today by alien plants.

Ctenitis squamigera (H. & A.) Copel.
A rare fern collected from Makaleha and the Duponte trail as well from the right fork Niu. A mid-elevation moist habitat form.

Diellia erecta Brack.
This rare fern was collected from Niu and various parts of the Wai'anae Range. A middle elevation, understory dryland habitat fern rarely seen in recent years.

Diellia falcata Brack.
Known from rocky, mid-elevation, dry understory. Common where found. Over 500 have been observed in the Wai'anae Range. Very rare in the southern Ko'olau Range. Common in leeward northern Wai'anae Range.

Diellia unisora Wagner
Was collected from the mid-elevation, dry gully face of leeward southern Wai'anae Range. Not seen for over 25 years.

Pteris (Schizostege) lidgatii (Hbd.) Christ.
Was collected from Lulumahu, Kaluanui and Waihole areas in the past. Not seen in recent years.

Rumohra cavifolia (Kunze.) Ching (Arachniodes carvifolia (Kunze) Ching).
Two old collections apparently from the Kaluanui area (Castle Trail) are known. Not collected in recent years. Known also from Mt. Ka'ala.

PORTULACACEAE

Portulaca lutea Soland. ex Forst. f., "Ihi"
Known from few populations of coastal windward Ko'olau and

Wai'anae Ranges. One large population known from inland Lualualei. Over 100 are known. Observed on offshore islets.

Portulaca villosa Cham. "Ihi"
Last seen in the late 1930's from the Koko Head area. Not known today.

PRIMULACEAE

Lysimachia filifolia Forbes & Lydgate
Recently re-discovered taxon known from a Waikāne sub-gulch pool. The only known aquatic Lysimachia from Hawai'i. Very local and rare on O'ahu.

Lysimachia forbesii Rock
A crawling taxon last collected from Castle Trail at the mid-elevation level in the mid-1930's. Probably extinct today.

Lysimachia hillebrandii Hook. f. ex Gray "Puahekili"
Widespread along drier, higher ridgetop and summit areas throughout the Wai'anae Range. Over 50 are known.

Lysimachia ovata (Heller) St. John
A rare Ko'olau Range taxon. Have not seen it and its status is unknown.

RHAMNACEAE

Alphitonia ponderosa Hbd. "Kauwila, Kauila"
Known today from two trees on O'ahu. One from Mäkua Valley and another from lower Pahole Gulch. Rare on O'ahu.

*Colubrina asiatica (L.) Brongn. "Anapanapa"
Known from one coastal population of about 10 plants from the Waimea Bay area.

Colubrina oppositifolia Brongn. ex Man "Kauila, Kauwila"
Known today from the drier mid-elevation Mokulē'ia Forest Reserve. Most of the populations are concentrated in Makaleha Valley. Over 100 trees are scattered in several populations. Regeneration noted in one population. No varieties recognized (MFPH).

Gouania gagnei St. John (G. meyenii Steud. in MFPH).

Gouania meyenii Steud.
Known today from five populations in mid-elevation ridge tops and gully slopes of Mākaha (3) and Wai'anae Kai (2). Over 150 plants survive today even though a landslide extirpated the largest population recently. Frequents steep rocky slopes. Has been cultivated.

Gouania oliveri St. John (G. meyenii Steud.).

Gouania vitifolia Gray
This viny taxon was known from Keeau Valley. Last collected in 1932. A recent survey revealed the habitat ravaged by cattle. Presumed extinct.

RUBIACEAE

Bobea elatior Gaud. var. brevipes (Gray) Hbd. "Ahakea" (B. brevipes A. Gray in MFPH).
Collected from Kalua'a Gulch in recent years. Probably much more abundant than the two collections as O'ahu's field personnel are unfamiliar with this taxon.

*Bobea hookeri Hbd. " 'Ahakea lauli'i" (B. sandwicensis (A. Gray) Hillebr. in MFPH).
A species of the lower to mid-elevation drier habitats of leeward and windward northern Wai'anae Range. Uncommon today as more than 20 are known from O'ahu.

Coprosma longifolia Gray var. oppositifolia Fosb.
Considered a hybrid of C. ochracea and C. longifolia from Mt. Ka'ala (MFPH).

Coprosma ochracea Oliv. var. kaalae St. John (C. ochracea W. Oliver in MFPH).
Scattered through the Mt. Ka'ala "bog" area and fringes by over 100 plants.

Gardenia brighamii Mann "Nānū, nā'u"
A rare, legally endangered taxon known from about 20 plants throughout the state. Three are known from O'ahu today - one from mid-elevation pasture of Pu'uku'ua and two from rocky, grass-covered lowland Nānākuli. Cultivated.

*Gardenia mannii St. John & Kuykendall "Nānū"
About 20 are known today and no regeneration noted. Wai'anae Range population no longer exists. Headed towards extinction in several years.

Gouldia terminalis (H. & A.) Hbd. "Manono" (Hedyotis terminalis (Hook. & Arnott) W. L. Wagner & Herbst
All varieties reduced (MFPH). A common taxon.

Hedyotis angusta Fosb. "Kopa" (Hedyotis schlechtendahliana Steud. in MFPH).
Common as the latter.

Hedyotis cookiana (C. & S.) Steud. "'Uiwi, 'āwiwi"
Known in the past from lowland areas of O'ahu, but considered extinct.

Hedyotis degeneri Fosb. and H. degeneri Fosb. var. coprosmifolia Fosb. (C. degeneri Fosb. in MFPH).
A rarer taxon known more recently from collections along Wai'anae Kai - Mäkaha ridge. Has escaped detection as field characters not fully understood by many of the contemporary O'ahu collectors.

Hedyotis fluviatilis (Forbes) Fosb. var. kamapuaana (Deg.) Fosb. (H. fluviatilis (C. Forbes) Fosb. in MFPH).
Known from the Punalu'u side of Castle trail. A disjunct population of less than 10 plants known today. Rare on O'ahu.

Hedyotis parvula (Gray) Fosb.
Known today from one ridge-top plant in Makaleha Valley. Very rare and was known to exist on high, open, dry, rocky habitats. The plant seen 10 years ago from 'Ōhikilolo no longer exists.

Hedyotis schlechtendahliana Steud.
Varieties nuttallii Fosb. & remyi (Hbd.) Fosb. not recognized (MFPH). As the former, common.

Morinda sandwicensis Deg. "Noni kuahiwi" (M. trimera Hillebr. in MFPH).
Today a common tree of the forested mid-elevation Wai'anae Range. Generally a plant of the canopied understory near gully floors and numbers into the multi-hundreds. Was extremely common in the windward central and southern Wai'anae Range until Hurricane Iwa of 1982. Regenerates readily in its habitat.

*Psychotria fauriei (Levl.) Fosb.
Considered very rare by some. Found along and close to the windswept crest of the Ko'olau Range. About 100 have been observed.

Psychotria hexandra Mann
Unknown today from O'ahu. Was a lower mid-elevation taxon and its habitat is disturbed today. May be extinct from O'ahu.

Psychotria kaduana (C. & S.) Fosb. var. longissima (Rock) Fosb. "Kōpiko kea"
Today the variety is seldom encountered along the higher mid-elevation to summit areas of the southern Ko'olau Range.

RUTACEAE

The genus Pelea is understood by a few, but agreement is not uniform among the knowledgable. Being familiar with field characters and unfamiliar with critical taxonomic characters, a generalized assessment is made here. Pelea is now in the genus *Melicope*, but the traditional *Pelea* is retained in this treatment.

Pelea christophersenii St. John
Was known from the wet forests of Pu'u Kaua and Ka'ala and considered very rare. Not known in recent years.

Pelea cinerea (Gray) Hbd. and *Pelea cinereops* St. John
These two taxa are quite similar in appearance and found from mid to higher elevation forests. Generally not found in the wetter zones and known today mostly from the Wai'anae Range. Over 50 of these two taxa are known.

Pelea clusiifolia A. Gray var. *dumosa* (Rock) Stone
(*P. clusifolia* A. Gray in *MFPH*).
As the reduced epithet, very common from both ranges.

Pelea descendens St. John (*P. lydgatei* Hillebr. in *MFPH*).

Pelea elliptica (Gray) Hbd. (*P. sandwicensis* (H. & A.) A. Gray in *MFPH*).

Pelea hiiakae Stone (*P. wawraeana* Rock in *MFPH*).
Uncommon taxon from the Wai'nae Range.

Pelea hosakae St. John (*P. honoluluensis* St. John in MFPH).
As the latter, fairly common.

Pelea kauaensis St. John (*P. christophersenii* St. John in *MFPH*).
As the latter, rare.

Pelea lakae Stone (*P. wawraeana* Rock in *MFPH*).
Uncommon taxon from the Wai'anae Range.

Pelea lydgatei Hbd.
Was known from northern to central Ko'olau Range. Apparently very rare and not known from any recent collections.

Pelea makahae Stone
Similar in appearance with *P. cinerea* and *P. cinereops* and inhabiting the mid to higher level summer dry forests along Mākaha-Wai'anae Kai ridge and nearby ridge tops. More than 30 are known.

Pelea pallida Hbd.
Known from the upper gully reaches of mid-high elevation windward southern Wai'anae Range and has not been collected in recent years. Very rare.

Pelea saint-johnii Hume
Known from middle to high elevations of both ranges. Status

unclear as it resembles the cineria-cinereops complex in the field. Probably rare.

Pelea sandwicensis (H. & A.) Gray
Today known from the mid to higher elevation southern windward Wai'anae Range. Uncommon and over 25 are known. It looks like a cinerea or cinereops with greatly recurved leaf margins.

Pelea storeyana St. John & Hume (P. christophersenii St. John in MFPH).
As the latter, rare.

Platydesma cornuta Hbd. and P. cornuta Hbd. var. decurrens Stone "Pilo kea"
A widespread and fairly common middle to high elevation taxon found usually in open understories throughout the forested Wai'anae Range. Threatened by the invasion of the alien Clidemia. Several hundred are known. The variety is known from the Ko'olau Range and considered rare.

Platydesma spathulata (Gray) Stone "Pilo kea" Varieties pallida (Hbd.) Stone and pubescens (Skottsb.) Stone not recognized (MFPH).
The taxon is encountered most frequently along the higher elevation wet Ko'olau Range, especially along the summit ridges. Also less commonly seen in the Wai'anae Range. Over 100 are known.

Zanthoxylum dipetalum Mann "Kāwa'u"
The entire taxon is depleted and endangered on O'ahu. Two trees are known from the Pūpūkea area while more than 10 are known from the windward southern Wai'anae Range and the windward Kaala mid-elevations. The variety degemeri (Skottsb.) St. John not recognized (MFPH).

Zanthoxylum semiarticulatum St. John & Hosaka "A'e, hea'e" (Z. kauaense A. Gray in MFPH).
The variety sessile (Deg.) Fosb. not recognized (MFPH) and appears under field observation to be a juvenile form in flower. A widespread middle to higher elevation dry and moist forest taxon from both ranges. The population is depleted to less than 50 plants today.

Zanthoxylum skottsbergii (Deg. & Deg.) St. John "A'e, hea'e" (A. kauaene A. Gray in MFPH).
Today about 10 plants of this form are known from O'ahu from the mid-elevation forest of central to southern windward Wai'anae Range.

SANTALACEAE

Exocarpus gaudichaudii A. DC. "Hulumoa, heau"

Today almost unknown from the Ko'olau Range, but fairly common and depleted in the Wai'anae Range. Generally found along drier high elevation ridge tops and over 50 plants are known from Pahole to Palikea.

Santalum is difficult to census as one large population may be derived by way of runners from a single "mother plant." Assessment will be by populations.

Santalum ellipticum Guad. and S. ellipticum var. littorale (Hbd.) Skottsb. (S. ellipticum Gaud in MFPH). "Iliahi a lo'e" A lowland to lower middle elevation taxon usually occupying pastureland or open drier habitats. The variety generally a coastal form and considered an environmental variant. Many populations are known from the northern and southern ends of the Wai'anae Range and southern leeward Ko'olau Range. Both forms fairly common.

Santalum freycinetianum Gaud. var. longifolium (Meur.) Deg. "'Ili ahi" (S. freycinetianum Gaud. in MFPH). As a species it is very viable and abundant along drier ridge tops along the 300-760 m(1000-2500 ft) levels of both ranges.

SAPINDACEAE

Alectryon mahoe St. John & Frederick "Māhoe" (A. macrococcus Redlk. MFPH). A common mid-elevation and higher taxon that numbers over 300 throughout the Wai'anae Range. Three large populations are known. Little regeneration noted and the entire population suffers from the ravages of the black twig borer (Xylosandrus compactus)

Sapindus lonomea St. John (S. oahuensis Hillebr. ex Radlk. in MFPH). As the latter epithet, common from both ranges.

SAPOTACEAE

Nesoluma polynesicum (Hbd.) Baill. "Keahi" Three plants are known from recent observations. Single plants are known from upper Nānākuli, mid-elevation Wai'alae Nui and Manuwai Gulch. This taxon is very rare on O'ahu.

*Pouteria (Planchonella) spathulata (Hbd.) Fosb. (P. sanwicensis (A. Gray) Baehni & Deg. in MFPH). Over 15 have been observed from lower and mid-elevation dry habitats of leeward Ko'olau and northern windward and leeward Wai'anae Range. Leaves are distinctly more tomentose and fruits are much smaller, pointed and bright yellow.

SOLANACEAE

Lycium carolinianum Walt. var. sandwicense (Gray) C. L. Hitchc. (L. sandwicense A. Gray in MFPH). " 'Ae'ae,

'ākulikuli 'ōhelo"
A widespread coastal taxon, but very depleted today. Rarer than believed and threatened by development.

Nothocestrum latifolium Gray "Aiea"
Known only from one tree today near Pu'u Pane area and another from Mäkua Valley. Very rare on O'ahu.

Nothocestrum subcordatum Mann " 'Aiea" (N. latifolium A. Gray in MFPH).

Solanum sandwicense H. & A. "Pōpolo 'aiakeakui"
Known from one recently discovered sprawling shrub from a drier talus slope of Napeioaulelo Gulch, Wai'anae Range. The other recently known Kalua'a Gulch shrub no longer exists.

THEACEAE

Eurya sadwicensis Gray "Ānini" var. grandifolia Wawra (E. sandwicensis A. Gray in MFPH).
Known from one plant near summit area of Könähuanui. Has always been rare on O'ahu.

THYMELIACEAE

Wikstroemia isae Skottsb. (W. oahuensis (A. Gray) Rock in MFPH).

Wikstroemia leptantha Skottsb. (W. oahuensis (A. Gray) Rock in MFPH).

Wikstroemia macrosiphon Skottsb. (W. oahuensis (A. Gray) Rock in MFPH).

Wikstroemia recurva (Hbd.) Skottsb. var. neriifolia Skottsb. (W. oahuensis (A. Gray) Rock in MFPH).

*Wikstroemia oahuensis (A. Gray) Rock
A very polymorphic taxon that grows in almost every known habitat. All other species of the genus on O'ahu are reduced to this epithet (MFPH). Ranges from a small shrub to a tree of 10 m (30 ft). Very common. Cultivated.

UMBELLIFERAE (Apiaceae)

Sanicula purpurea St. John & Hosaka
One plant was observed in 1985 from the misty, moss covered summit between 'Aiea and Waimano. Not seen in the 1987 survey. Besides one 1949 collection, all others were collected in the 1930's. Extremely rare and possibly extinct because of the alteration of its mossy habitat by alien grasses.

*Sanicula mariversa Nagata & Gon
Recently described taxon and known from two very restricted

populations on dry, exposed ridgetops from 'Ōhikilolo and Keeau. A total of about 70 plants are known.

URTICACEAE

Neraudia angulata Cowan and N. angulata Cowan var. dentata Deg. & Cowan (N. angulata Cowan in MFPH).
A rarer shrub or small tree inhabiting mid-elevation and higher dry ridges. About 20 plants are scattered throughout the length of the Wai'anae Range.

Neraudia melastomifolia Gaud. "Ma'oloa, ma'aloa"
A variable taxon and very common throughout the Wai'anae Range. Not as common in the Ko'olau Range. Found in mid-elevation canopied understory or near gully floor. Rarity is relevant to the season one observes this taxon. The shrub seems relatively short-lived (less than 10 years) and the entire range may be devoid of any plants for a season or two. Several seasons may elapse before mature plants are observed.

Pipturus oahuensis Skottsb. (P. albidus (Hook. & Arnott) A. Gray in MFPH) "Mamaki"
Very common from both ranges when considered by the latter epithet.

Urera glabra (H. & A.) Wedd. "Ōpuhe"
A common widespread taxon from both ranges. A thousand plants is a resonable estimate.

Urera kaalae Wawra
An understory taxon usually found along higher elevation talus slopes near upper reaches of gully floors. Not too long-lived and has a tendency to die about the same time throughout its range. During juvenile stages may be considered very common. Over 75 are known and found mostly south of Kolekole Pass on windward Wai'anae Range. Known number of populations quite depleted, but quantitatively unchanged.

VIOLACEAE

Isodendrion hillebrandii St. John "Aupaka" (I. pyrifolium A. Gray in MFPH).
Considered extinct from O'ahu.

Isodendrion laurifolium Gray "Aupaka"
Known today from one restricted population in a mid-elevation semi-dry understory in Mäkaha. Over 30 plants were observed.

Isodendrion longifolium Gray "Aupaka"
Known from four small populations near Pu'u Pane and Makaleha Valley. Generally a mid-elevation, summer dry, under canopy and sloping terrain inhabitant and numbers over 30 plants. The Pụ'u Pane population today is ravaged by feral pigs.

Isodendrion _pyrifolium_ Gray
Considered extinct today.

Isodendrion _waianaensis_ St. John (_I_. _laurifolium_ Gray in _MFPH_).
As the latter, rare.

Viola _chamissoniana_ Ging. "Pamakani"
Known today from two populations of less than 10 plants inhabiting high, steep, rocky, open slopes on both sides of Kolekole Pass. This taxon is extremely rare on O'ahu.

*_Viola_ _kauaensis_ Gray
Two summit area populations were observed between Pe'ahināi'a and Waikāne and about 20 plants are known. Found in open, moss and filmy liverwort covered, heavy wind and rain exposed ridge tops off summit crestline. May be a new species.

Viola _oahuensis_ Forbes
Found along or near the summit crestline of the Ko'olau Range. Inhabits open or understory wet, windblown areas and less than 50 were oberved. Several populations are known, but very depleted in the past two years.

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OTTO DEGENER
(1900-1988)
A PERSONAL APPRECIATION

Isabella A. Abbott
University of Hawai'i, Manoa

If Degener's seven-volumed "Flora Hawaiiensis" were a new contribution and was submitted for the New York Botanical Garden Book Prize, there's no question in my mind that they would win a prize for the author since the black and white pen and ink drawings are superb. They were mostly done at a time (the 1930's and 1940's), when he was able to find talented helpers among the local young people whom he employed as artists, and field collectors. With them, he would scour the Wai'anae mountains from the steep northwestern slopes of Ka'ala west to Ka'ena Point, in peaks and valleys that were little known to us who were doing most of our hiking in the Ko'olau. Sometimes he would bring some of the collections to the Bishop Museum when I happened to be in the herbarium. If he wasn't in a hurry, he would let me examine some of the new finds while he would tell stories about how some of the specimens were collected (stories that the current crop of field collectors like John Obata, Steve Perlman and Steve Montgomery can match). Or he would give some suggestions on the systematics of the taxa we were looking at. It was a way of sharing, for by then I had already shifted interests to marine algae, although I had had three years of flowering plant studies as an undergraduate with Dr. St. John. Perhaps he thought that I had strayed away from the real plants, but in later times he would sometimes send a note about some algae he had collected (now in Bishop Museum), or some ancient reference he had come across that had something about Hawaiian algae in it.

I never told him that as a teacher of ethnobotany, how useful his book, "Plants of Hawaii National Park" is as a resource, and how many times I have used it in order to check on memory, or other authors. The little-known item that "it is estimated that on one square mile planted to [taro] and diligently cultivated, over 15,000 people could subsist for an entire year" (p. 81), is not only informative but makes a lecture "relevant". Note well, that this book was published in 1930, and reprinted in 1975. Besides valuable notes, I treasure it for the photographs from the 1920's, as well as for those fine black and white pen and ink drawings.

Maybe legendary botanists (biologists) "aren't made any more". But those like Otto Degener enrich us in so many ways, some beyond Botany.

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

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WEED INVASION OF MARSILEA VILLOSA POPULATION AT 'IHI'IHILAUĀKEA CRATER, KOKO HEAD, O'AHU.

Lyndon Wester
Toshihiko Ikagawa
Department of Geography
University of Hawai'i at Manoa
2424 Maile Way
Honolulu HI 96822

INTRODUCTION

Marsilea villosa Kaulfuss is an endemic Hawaiian fern closely related to, but distinct from, *M. vestita* of western North America (Johnson 1986, Brugemann 1986). The genus of approximately 45 species has a wide geographical range and the plants are typically found rooted in mud around the edges of ponds or in ephemeral pools. The wide range of the genus was probably achieved by dispersal on or in migratory water birds.

The Hawaiian name for the species is 'ihi'ihilauākea or the "wide-leafed 'ihi'ihi." The root word 'ihi is also applied to species of *Oxalis* and *Trifolium*, whose leaves superficially resemble those of *Marsilea*, as well as members of the genus *Portulaca* which are quite dissimilar in appearance (Degener and Pekelo 1975). The fact that both the *Portulaca* and the *Oxalis* have a sour taste, and are used in traditional medicinal preparations, may explain the similarity in names.

Marsilea villosa is a hardy species, well adapted to withstand drought and can be readily cultivated, but its requirements for survival in the wild are not often met in Hawai'i. It reproduces vegetatively from creeping rhizomes, but structures for sexual reproduction will only develop when the plant is subjected to desiccation (Forbes 1920, Johnson 1986). Furthermore the sporocarps will not release spores until submerged in water. Suitable natural habitat for the species were probably never common and it was restricted to a few depressions subject to occasional flooding in the dry lowlands. The species has been collected from such sites on Moloka'i, Ni'ihau and O'ahu (Table 1) and observed at a few other locations (Tabata 1980). *Marsilea* also grew in taro patches and some of the nineteenth century records of the species came from such sites. The decline of taro as a crop, and expansion of settlement in the dry lowlands, has resulted in the destruction of most of the habitat for the plant. Since 1948 it has been recorded in only two sites; an ammunition magazine in Lualualei Valley, O'ahu, and in a shallow depression on the flank of Koko Head (Figure 1).

Marsilea on Koko Head grows in the bottom of a small volcanic crater and is the healthier of the two known populations.

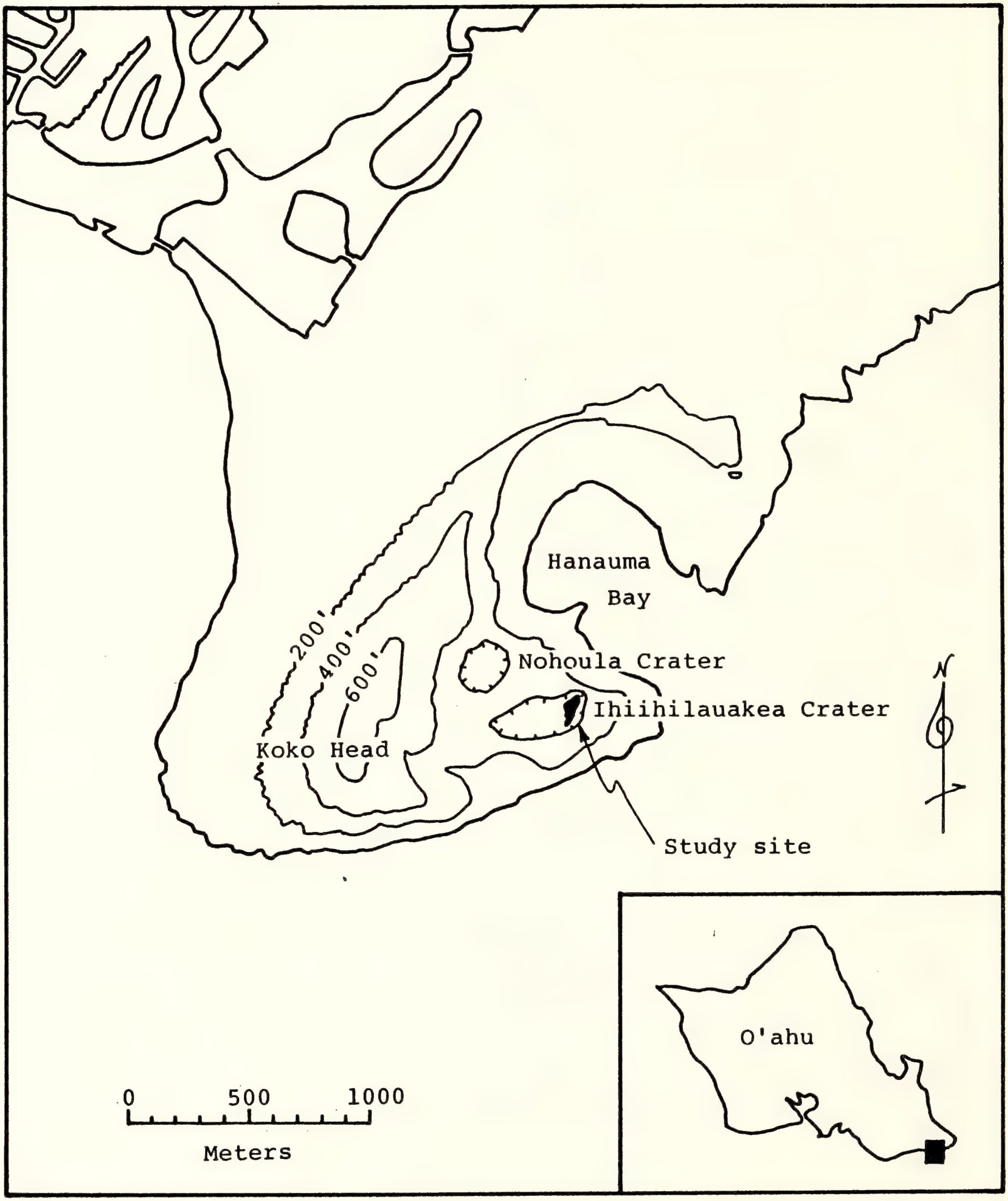
Hanauma
Bay
Nohoula Crater
Ihiihilauakea Crater
Study site
Koko Head
200'
400'
600'
N
0
500
1000
Meters
O'ahu

Figure 1. Location of study site.

It has been protected to some extent by the inaccessibility of the site but it is feared that continued physical damage to the plants, and gouging of the soil by off-road vehicles, has resulted in the progressive invasion of weeds (Hawaiian Botanical Society Newsletter 1986).

In December 1969, Herbst noted that Marsilea "completely and densely carpeted the entire bottom of 'Ihi'ihilauākea Crater" (HAW Herbst #1387). It is worth noting that the previous three months had been quite wet and approximately 500 mm (21.5 inches) of rain had been received in the rain gauge at nearby Makapu'u. In contrast, Fosberg visited the site in 1961 after two dry years. He stated that the Marsilea had been "substantially invaded by weeds" and listed some 18 species including all of those which are abundant at present such as Echinochloa colonum, Setaria verticillata, Merremia aegyptia, Xanthium strumarium, Tricachne insularis and Cynodon dactylon (Fosberg, 1961; see Table 2). Observations recorded by botanists on herbarium labels of plants collected from the crater provide some information about the community. In 1964 it was observed that the fern was "growing with grasses" (BISH Carlquist #1692) and with Xanthium, Portulaca, Prosopis and Sida (HAW Young s.n.). More recently, during 1979, collectors stated that the fern was abundant over an area of "about an acre, with grasses and a hairy Convolvulus vine (sterile). Motorcycle and jeep tracks all over the central part of the 'meadow'" (Davis and Kores, BISH s.n.).

Table 1. Herbarium collections of Marsilea villosa

Location of collection	earliest collection	most recent collection	number of collections*
Moloka'i			
Anapuka	1948	1948	1
Mokio	1928	1928	1
Ni'ihau			
Lake Loe	1949	1949	1
O'ahu			
no specific location	1817	1841	4
'Ewa	1932	1932	3
Kaimuki	1916	1920	5
Makapu'u	1935	1968	3
Koko Head	1929	1980	20
Lualualei	1930	1980	4

* Specimens collected in the same location on the same day were counted as one record.
Source: Brugemann (1986).

Johnson (1986) has observed that Marsilea shares many characters with weedy angiosperms such as long propagule dormancy, self compatibility, occurrence in early successional habitats and rapid growth. The fern has coexisted for more than two decades with most of the alien grasses and herbs currently associated with it. The balance between Marsilea and the competing weeds probably shifts from year to year depending upon the distribution and abundance of rainfall. However the disturbance by off-road vehicles is likely to favor the alien species because of their superior ability to colonize the bared substrate.

The purpose of this study is to obtain baseline data against which changes in the extent and composition of the Marsilea community can be monitored and to provide a basis for management.

PHYSICAL SETTING

Koko Head is a tuff cone which contains two craters, Nono'ula and 'Ihi'ihilauākea, and is one of several volcanic features formed on the Koko Head fissure which may have been active as recently as 32,000 years ago (Figure 1). The floor of 'Ihi'ihilauākea Crater is about 60 meters (200 feet) above sea level and floods after heavy rains.

The Marsilea population is confined to a depression in the floor of 'Ihi'ihilauākea Crater and extends over an area of approximately 0.5 hectares. The depression is essentially oval in shape, approximately 110 by 50 meters. Its long axis is oriented NNE-SSW, with a narrow extension 70 by 40 meters protruding from the southeastern quarter. The area is surrounded by an almost continuous thicket of kiawe (Prospis pallida), which provides protection, particularly to the eastern side, from the prevailing Northeast Trade Winds. Marsilea is largely confined to the open areas and only to a minor extent is it found under the canopy of the kiawe (Figure 2). Dense stands of the tall perennial grass Panicum maximum occur around the edges of the Marsilea.

The average annual rainfall of the site is approximately 800 mm (30 inches) (Giambelluca, Nullet and Schroeder 1986). A series of dry years, during which the crater may have failed to flood, were followed by the extremely wet winter of 1987-88. A rain gauge, kept on Lumaha'i St. on the western flank of Koko Head, registered 1269 mm (49.95 inches) of rain for 1987 of which 773 mm (30.43 inches) fell in the month of December before 5 pm on 31 December. In addition, a very heavy rainstorm, which began on New Year's Eve, deposited a further 135 mm (5.3 inches) before 10 am on New Year's Day and caused serious flooding in eastern O'ahu.

Runoff from the unusually heavy rain created a water body up to a meter deep in 'Ihi'ihilauākea Crater which remained for several weeks. This stimulated the growth of the Marsilea and began a cycle of sexual reproduction. Many of the associated species were drowned but the existing fern plants grew rapidly in the standing water and sporophytes became established on bare substrate. However as the water evaporated or infiltrated annual species began to proliferate.

METHODS

To survey the species composition and assess the extent of weed invasion, the Marsilea sward was divided into 10 x 10 meter quadrats and the cover of each species was estimated. The boundary of the Marsilea population, which was often sharply defined, and the adjacent kiawe canopy, were mapped in detail. Sampling was done between 27 February and 6 March 1988. The position of large kiawe trees was also located as landmarks for future reference.

Three sample areas of varying size and situation were marked and carefully weeded of all species except Marsilea. The sites were observed and photographed on a weekly basis.

RESULTS

The extent of the Marsilea was compared with a map of the species made in 1984 (Newman and Valier 1984). The differences were small and could be attributed to mapping error or varying interpretation of boundaries (Figure 2a).

It was observed that there were patches of almost pure uninterrupted Marsilea. Those quadrats where its cover was in excess of 80% were confined within the central depression; the southerly arm had little Marsilea (Figure 3a). Species richness showed considerable variation over the study area and ranged from as few as three species per quadrat to as many as 16. A total of 26 species occurred in association with Marsilea which, with one exception (Sida fallax), were introduced species (Table 2). There are two zones of marked floristic richness (Figure 3b). One was at the northern end of the area where most of the foot and vehicular traffic enters through a break in the kiawe thicket. Here the soil was conspicuously compacted. The other species-rich zone stretched along the eastern side of the central depression and occupied most of the southeastern arm. This latter area was shaded by kiawe and sheltered from the full force of the prevailing winds. The open central part of the stand had by far the lowest species diversity and the exposed western side was only slightly more rich in species.

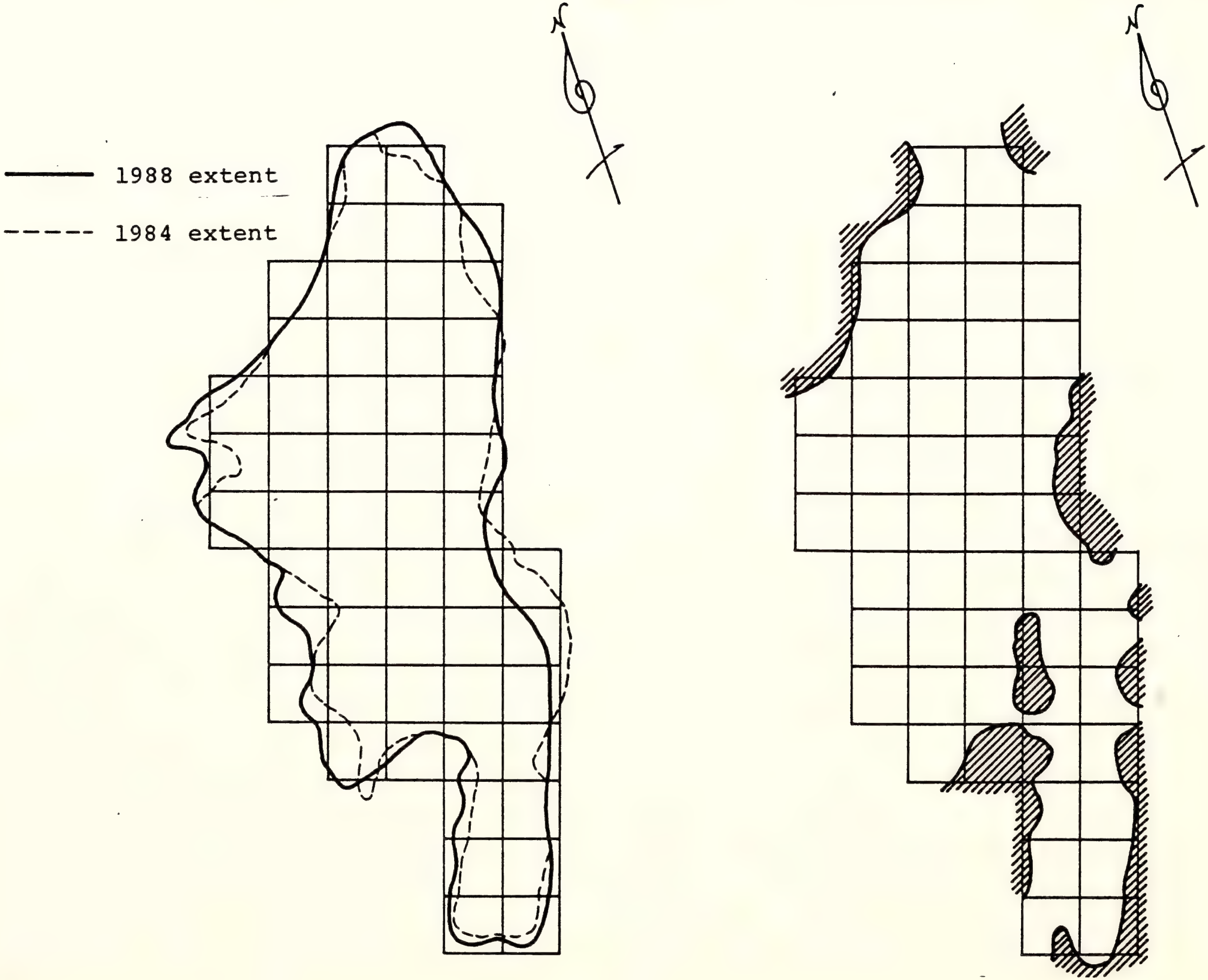
1988 extent
1984 extent
N
N

Figure 2. (a) Extent of *Marsilea villosa*. (b) Extent of *Prosopis pallida* (shaded area).

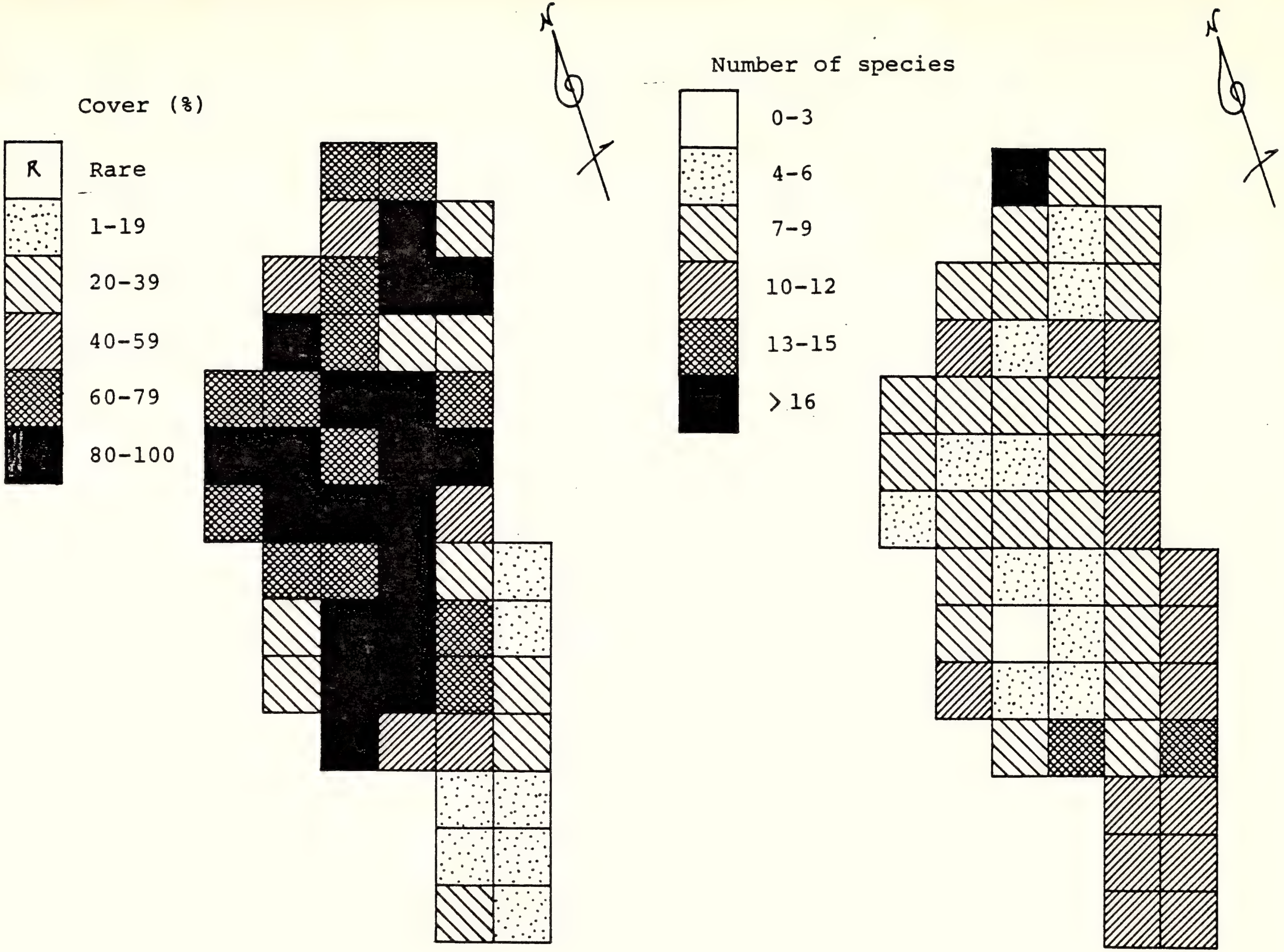
Cover (%)
R
Rare
1-19
20-39
40-59
60-79
80-100
N
Number of species
0-3
4-6
7-9
10-12
13-15
> 16
N

Figure 3 (a) Estimated cover of Marsilea villosa. (b) Total species richness.

Table 2. Cover and frequency of species. (Total area 5,300 sq. m.; Total number of quadrats 53).

	Cover (sq. m)	Frequency
**Marsilea villosa*	2994	53
**Echinochloa colonum*	1230	52
**Setaria verticillata*	340	31
**Prosopis pallida*	190	24
**Tricachne insularis*	172	8
Panicum maximum	140	18
**Cynodon dactylon*	83	12
**Xanthium strumarium*	77	36
**Solanum americanum*	55	35
Portulaca oleracea	38	34
**Merremia aegyptia*	33	33
**Chloris barbata*	18	16
**Phaseolus lathroides*	17	17
**Sonchus oleraceus*	16	16
Asystasia gangetica	8	7
Lycopersicon pimpinellifolium	7	7
Momordica charantia	7	7
**Ageratum conyzoides*	7	7
Bidens pilosa	6	6
**Malvastrum coromandelianum*	6	6
Commelina bengghalensis	2	2
Coronopus didymus	1	1
Sida fallax	1	1
Phyllanthus debilis	1	1
Stachtarpheta jamaicensis	1	1
Chamaesyce hirta	1	1
Atriplex semibaccata	1	1
bare ground	177	10

* Species noted in area by Fosberg (1961).

Of all the species associated with *Marsilea*, *Echinochloa colonum* had the highest frequency and cover. It grew most densely in the middle of the main oval depression (Figure 4a). Other than the kiawe, which only occurred around the edge of the stand, the five species which were most widespread, and with the largest cover, were the grasses *Setaria verticillata*, *Tricachne insularis*, *Panicum maximum* and *Cynodon dactylon*. *Setaria* occurred mainly along the protected eastern side of the depression (Figure 4b). *Tricachne* and *Cynodon* were conspicuously localized (Figure 5a and 5b). A number of broadleaf herbs, such as

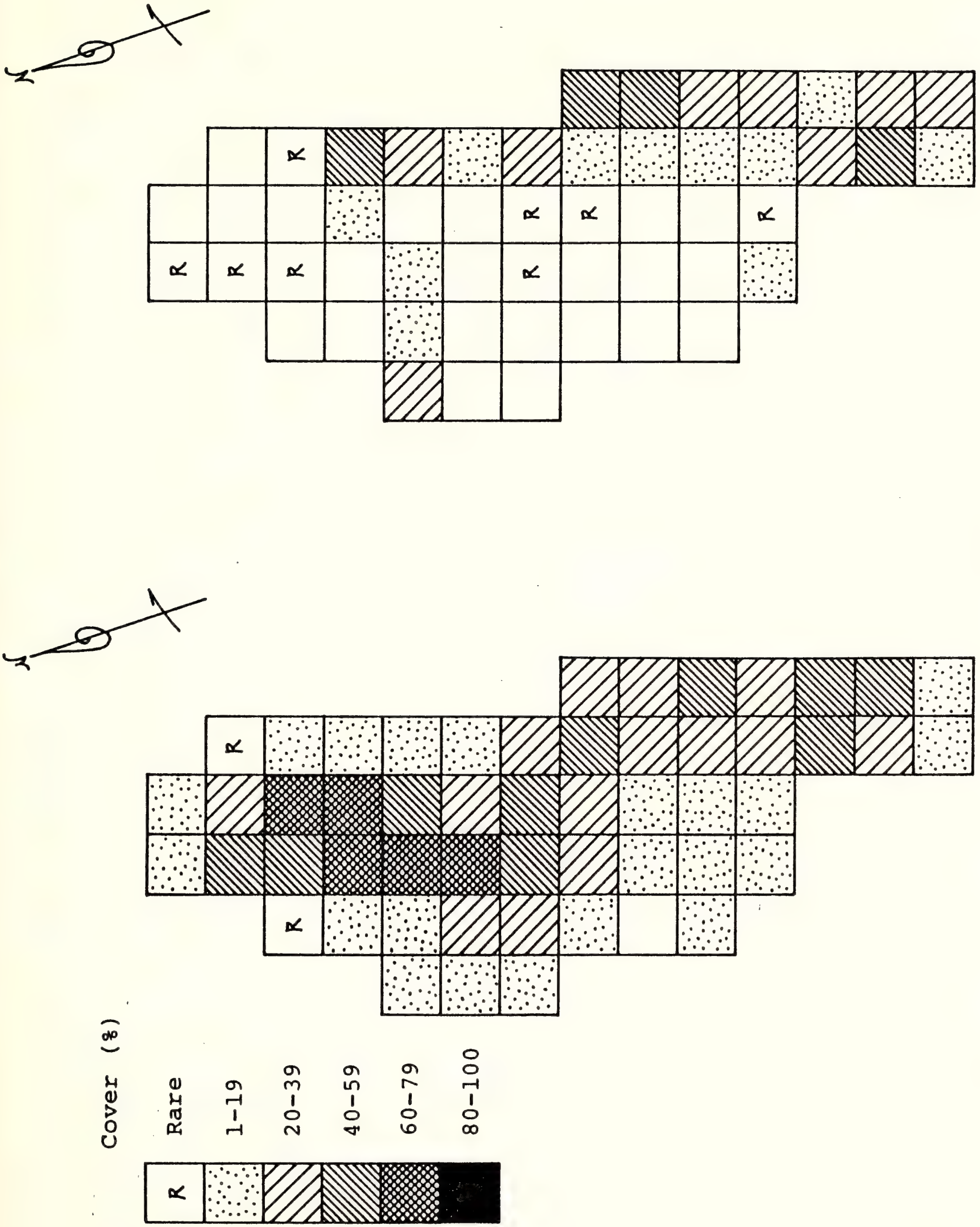
Cover (%)
R
Rare
1-19
20-39
40-59
60-79
80-100
N
N

Figure 4. (a) Estimated cover of Echinochloa colonum.
(b) Estimated cover of Setaria verticillata.

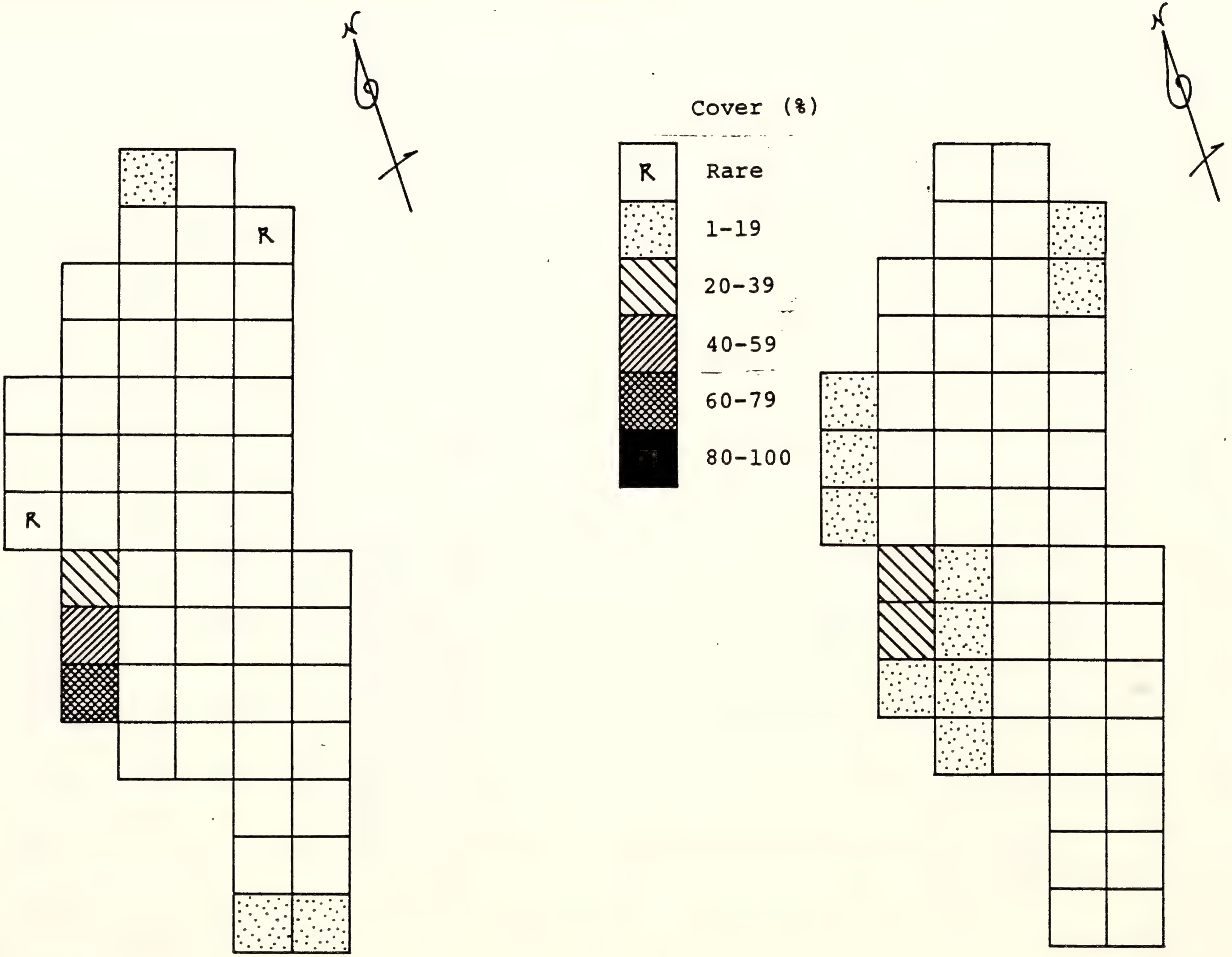
N
R
N
Cover (%)
R Rare
1-19
20-39
40-59
60-79
80-100

Figure 5. (a) Estimated cover of _Cynodon dactylon_.

(b) Estimated cover of _Tricachne insularis_

Xanthium strumarium, *Solanum americanum*, *Portulaca oleracea* and *Merremia aegyptia*, occurred at the time of sampling. However, by March 1988, the *Merremia* had begun to form extensive choking mats and *Xanthium* had grown so large that its canopy tended to shade out the fern carpet beneath it. Most of the other species only occurred around the edge of the *Marsilea* stand under the protection of the kiawe canopy. *Marsilea* does not occur to any significant extent under the canopy of the kiawe. However the kiawe seems to have undergone a serious decline in recent years. In aerial photographs dating from 1965 a closed canopy of kiawe surrounds the clearing. At present many patches have died and dead branches are evident on most living trees.

In the experimental patches which were weeded, *Marsilea* grew much more vigorously than in the surrounding unweeded areas. It is not surprising that the exotic invaders seem to be acting as competitors as most *Marsilea* species are intolerant of crowding and shade (Johnson, 1986).

INVADERS OF *Marsilea* SWARD

Echinochloa seems to be the most serious threat to the *Marsilea* population. This grass has the largest cover of any of the invading species and is the dominant in the central portion of the depression which has suffered most disturbance from off-road vehicles. Young individuals were found even in sectors dominated by *Marsilea*. The grass appears to behave as a perennial in this environment and survives flooding. It was observed growing in standing water and was able to spread quickly by runners as water receded. *Setaria* was the next most common associate but this grass had a more restricted distribution and seemed to prefer protected sites.

Panicum maximum formed dense, pure stands around the margins of the *Marsilea* sward. Individuals on the fringe were killed, most likely by prolonged inundation, and *Marsilea* was found growing vigorously around the dead tussocks. Periodic flooding probably prevents the wholesale replacement of the *Marsilea* by this tall perennial grass and probably excludes most other perennials, such as the shrub *Sida fallax*. An estimate by collectors that the ferns covered "about an acre" in 1979 (BISH Davis and Kores s.n.), the detailed map of 1984, and present measurements, are roughly consistent indicating the stability of the *Marsilea* stand over this limited time scale.

Merremia aegyptia, a drought tolerant creeper, was widespread and occurred in 33 of the 53 quadrats. It is able to form dense choking mats which probably suppress the *Marsilea* growing beneath it. It is probably one of the more serious competitors of the fern.

Two grasses, *Cynodon dactylon* and *Tricachne insularis*, grow densely and seem to exclude Marsilea in a few places. They have been present at least since 1961 and still have only localized occurrences in the area occupied by Marsilea. Nevertheless their populations should be monitored to determine any tendency to spread.

Several of species were found widely but nowhere in great abundance. These would include Solanum americanum which occurred in both full sun and shade. Most individuals in full sun are stunted but tall, large-leaved individuals are abundant around margins and in the shade of kiawe. Scattered individuals of Portulaca oleracea were widespread through the Marsilea area but nowhere does this species grow densely. Plants are not in a healthy state and appear to be grazed by caterpillars.

Chloris barbata was locally abundant in many patches throughout the area especially in sites of disturbance such as potholes and places where traffic is greatest. Phaseolus lathroides plants were found frequently throughout the area but nowhere were very vigorous. Similarly Sonchus oleraceus was widespread. Other species were found in very low frequencies and cover and were mostly confined to the shaded margins.

QUALITY OF Marsilea SWARD

On the basis of the density of Marsilea, and the presence of infesting weeds, the Marsilea sward was divided in the three subjective classes (Figure 6).

Class I Here Marsilea is by far the dominant and few other species occur. This type forms an interrupted doughnut shape in the central oval depression. It is broadest in the south and west and broken in the north where a gap in the kiawe has allowed vehicles to enter. Other gaps exist in the southeast side.

Class II Marsilea is still an important species in this class but there is a significant admixture of other species. In the northeast is a sector invaded by Cynodon and in the south central area is a tract with considerable Echinochloa and other species. One small area of Class II also exists in the southeastern arm of the clearing.

Class III These areas are dominated by grasses and the Marsilea is present as a minor component. The main extent of this class is in the central part of the oval. The southeastern extension of the depression is also largely dominated by Setaria, in sheltered sites adjacent to the kiawe canopy, and by Echinochloa in more open situations.

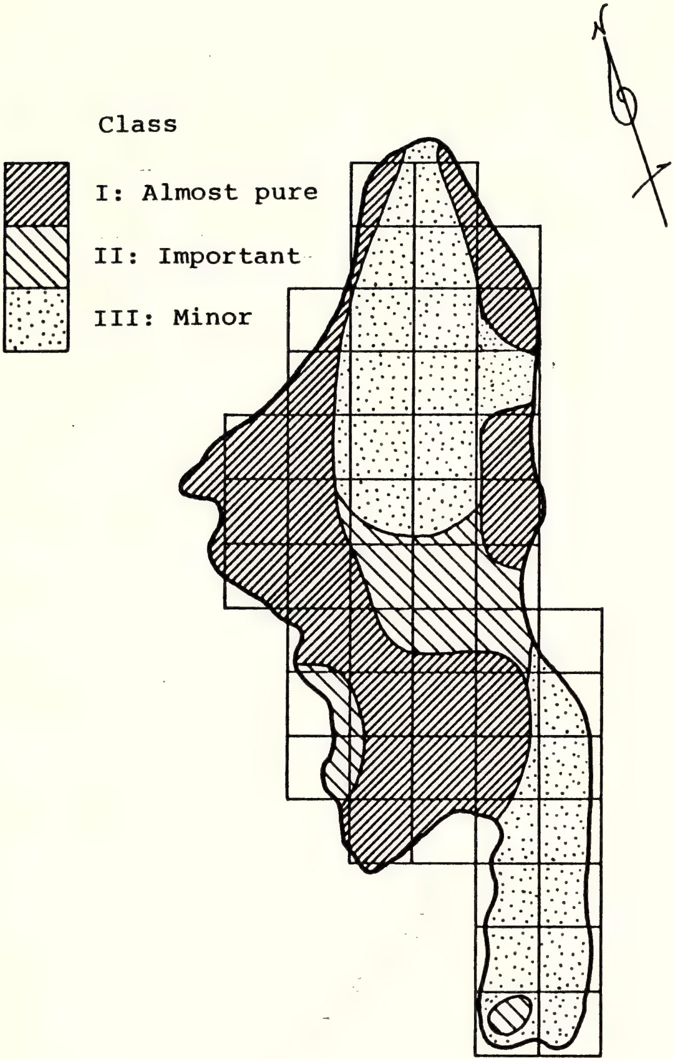
Class
I: Almost pure
II: Important
III: Minor
N

Figure 6. Quality of Marsilea villosa stand.

CONCLUSIONS

The total extent of the Marsilea sward has not changed significantly since 1979. Panicum maximum, the conspicuous dominant in the surrounding areas, was not mentioned by Fosberg in 1961. It has probably benefited by the opening of the kiawe canopy in recent years but plants in the lowest areas were killed by recent flooding. The vigorous growth of Marsilea around the dead tussocks suggests that the grass probably does encroach between flooding episodes. Similarly Sida fallax shrubs with thick woody stems, representing several years growth, were also drowned but can be expected to reinvade in a series of drier years.

The Echinochloa appears to be the most serious competitor to Marsilea. It is adapted to withstand inundation and has a perennial habit in this area. It flourished in standing water and spread to become the dominant species in some parts. Marsilea has an advantage over annual grasses in that it grows while still submerged. However, as the substrate dries, species such as Setaria and Chloris shade out the Marsilea. The creeper Merremia was perhaps even slower to respond but choking mats formed as the Marsilea was already dying back at the end of its cycle of growth.

That alien weed species suppress Marsilea is indicated by the fact that growth of the fern was much more vigorous where competitors were artificially removed.

POSTSCRIPT

Volunteers from the The Hawaiian Botanical Society and the Nature Conservancy carried out the following plan of management between March and May 1988.

1. All grasses, Xanthium, and Merremia were removed from Class I areas.

2. All grasses (except Cynodon) were removed from Class II areas along with Xanthium and Merremia.

3. All significant weeds were removed from the northern third of the Class III.

4. Merremia was removed throughout the whole area where Marsilea occurred.

5. A row of metal stakes was placed across the gaps in the kiawe thicket in an effort to discourage entry of four-wheeled vehicles and a permanent sign was erected explaining the need to protect the area.

ACKNOWLEDGEMENTS

The authors wish to thank members of the Hawaiian Botanical Society and The Nature Conservancy Hawaii for their work to remove weeds from the Koko Head Marsilea stand.

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THE SPREAD OF FIRE IN ALIEN GRASSES AFTER LIGHTNING STRIKES IN HAWAI'I VOLCANOES NATIONAL PARK

Tim Tunison and Julie Leialoha
Resources Management Division
Hawai'i Volcanoes National Park
HI 96718

INTRODUCTION

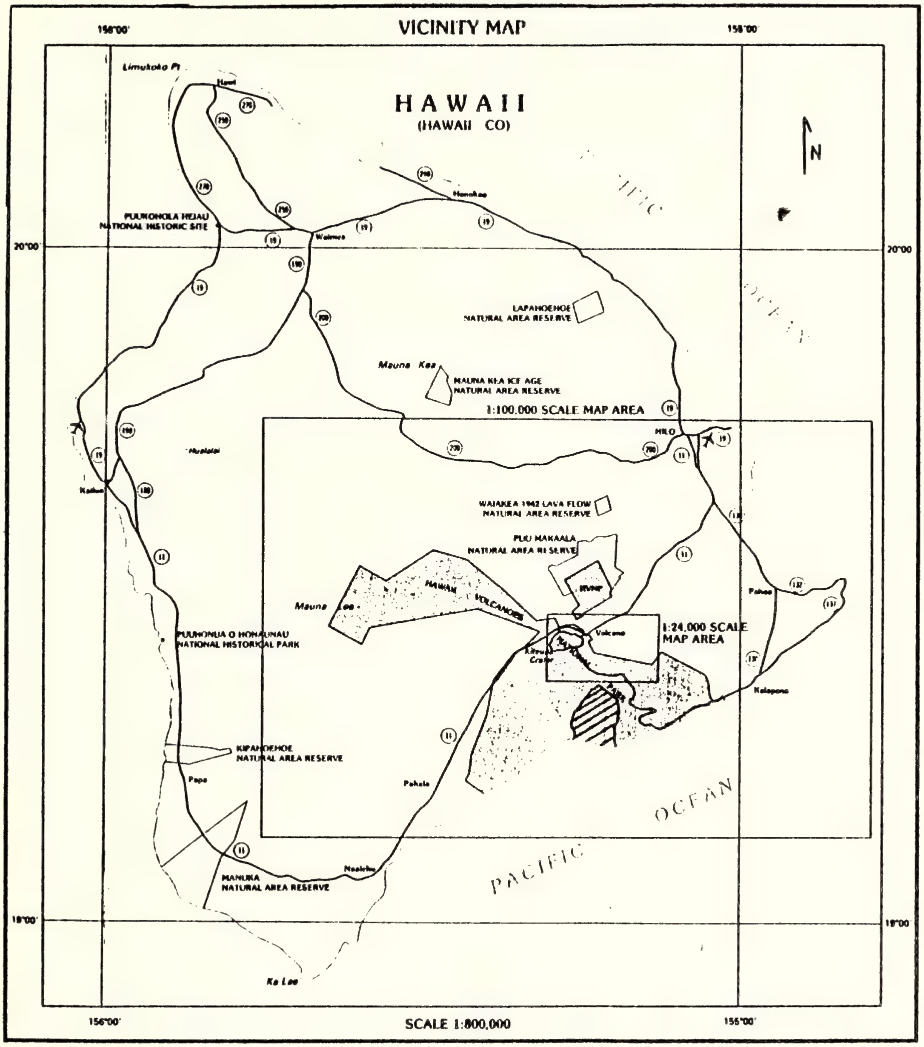
Although lightning is not common in Hawai'i, it is far from rare. The State has 20-30 thunderstorms per year (Price 1968), and lightning is almost always accompanied by rain, frequently heavy rain (Vogl 1969). Blumenstock and Price (1972) report that thunderstorms occur in the lowlands only 5-10 times in a year on the average.

Lightning-caused fires have occurred at very low frequency in Hawai'i. Vogl (1969) asserted the importance of lightning as an ignition source, but could document only two lightning caused ignitions and then only anecdotally. A definitive check of the records of fire management agencies in the State of Hawai'i was not made by us. However, state and federal sources on Hawai'i Island were consulted. Lightning was cited as a possible cause of the Pepeiau Fire in Hawaii Volcanoes National Park (HAVO) in 1971 (National Park Service 1978). Sorenson (1979) hypothesized that lightning accounts for some clusters of 'ohi'a-lehua snags, attributed to one form of ohia-dieback by Mueller-Dombois et al. (1980). Steve Shackleton, a ranger at HAVO (pers. comm.), reported several circular areas of completely scorched vegetation, some as large as 0.1 ha, in Ola'a rainforest following a severe lightning storm in 1986. Charles Wakida, a forester with Hawai'i State Department of Land and Natural Resources, (pers. comm.) was able to recall three fires on the Big Island in the last 25 years probably caused by lightning. Michael Tomich, a fire fighter at Pohakuloa Training Area (pers. comm.), confirmed a lightning caused fire burning in alien grasses during a dry lightning storm in Kona in March, 1988.

The purpose of this report is to document lightning as the probable cause of the "Uila" (= lightning in Hawaiian) Fire in Hawai'i Volcanoes National Park (HAVO). This fire was discovered 5 September 1987, burning approximately 4,250 ha of alien grassland and 'ohi'a-lehua (Metrosideros polymorpha) forest, woodland, and savanna during the next 4 days (Fig. 1).

THE "UILA" FIRE

A major thunderstorm crossed over HAVO on September 4, 1987. An observer along Hilina Pali Road 2-3 km west of the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MAUNA KEA ICE AGE
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Figure 1. Location of Uila fire in Hawaii Volcanoes National Park. Burned area is cross-hatched.

probable point-of-origin reported lightning above Poliokeawe Pali (Fig. 2), including discharges between clouds and the ground (Stacy Okimura, a HAVO Resources Management employee, pres. comm.). She also noted that a short, light rain accompanied the thunderstorm at this location.

Smoke was reported above Poliokeawe Pali at approximately 1330 h the next day, and observers reached the fire within 90 minutes. Wind speed and direction were recorded. Winds were northeasterly and 11-16 kph at eyelevel as measured by a hand-held wind meter in an open area away from trees. The perimeter of the fire was mapped from a helicopter at approximately 1530 h (Fig. 2).

EVIDENCE FOR LIGHTNING AS CAUSE OF FIRE

Lightning was not observed to ignite the "Uila" Fire. However, circumstantial evidence points to lightning as the probable source of ignition. Trees near the point-of-origin were hit by lightning during the thunderstorm that preceded the fire, and the point-of-origin is not an area used by people.

Location of point-of-origin

The point of origin of the fire is approximately 820-835 m elevation, south-west at 210° and 2.1 km from Ainahou Ranch House (Fig. 2). Its location was inferred from the following lines of evidence:

1. The map of the fire drawn at 1530, two hours after discovery. The point-of-origin is located within the perimeter of the fire at this time.

2. The shape of the fire and the speed and direction of wind in the early stages of the fire.

3. Predicted rates of spread of a backing fire from the point of origin.

4. Char heights on burned trees.

The northeast-southwest trending, elliptical shape of the fire reflects the wind direction and speed at the time of the fire. Wind-driven fires are elliptical in shape because fire fronts on different perimeters of a fire spread at different rates. The head of a fire, with the wind directly pushing it, spreads very rapidly. The rear of a fire, backing into the wind, spread very slowly. Flanks of a fire spread considerably more slowly than the head and somewhat faster than the rear of the fire.

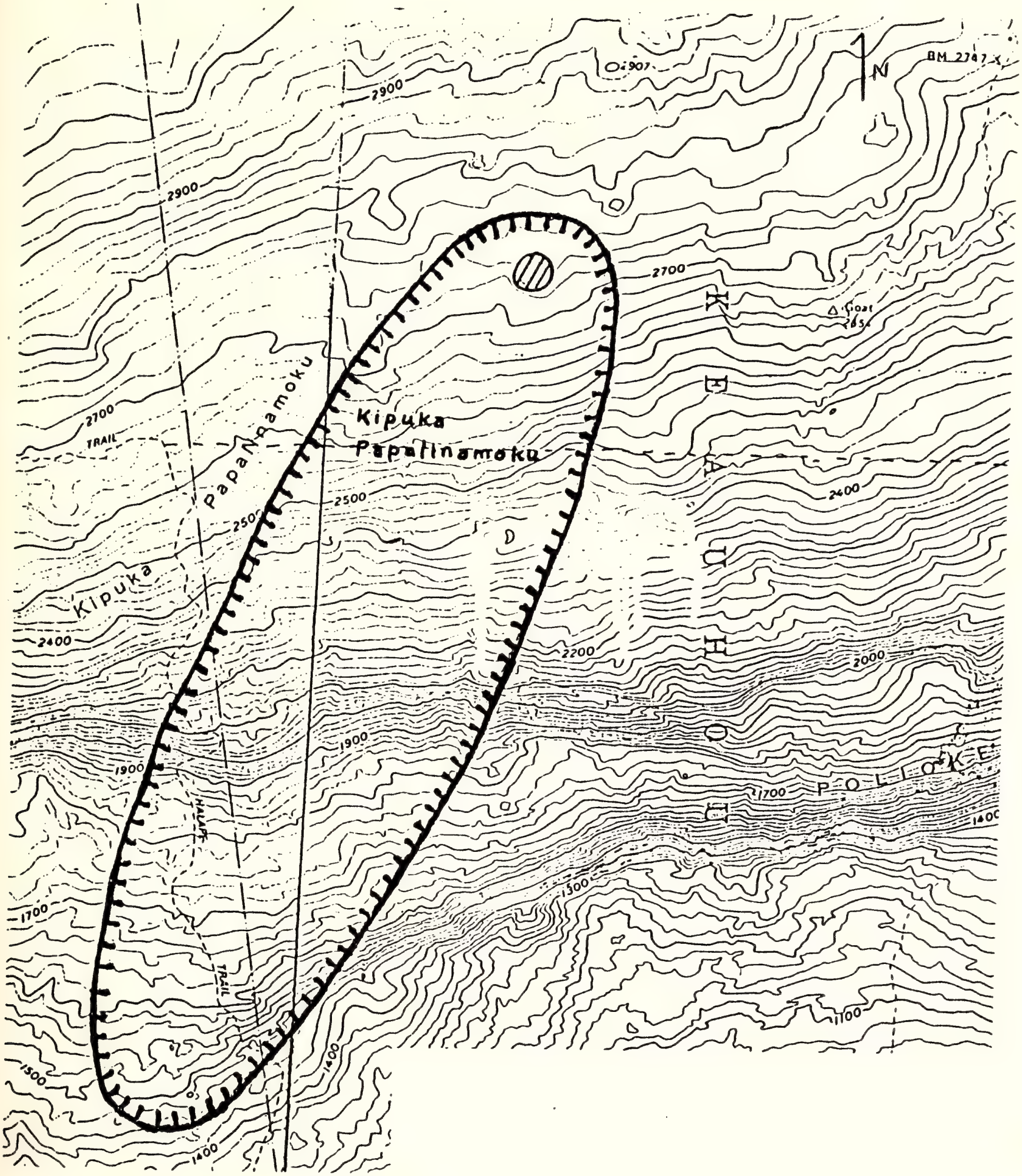
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Figure 2. The perimeter of the Uila fire, as mapped at 1530h on September 5, 1987 and the probable point of origin (cross-hatched) above Kīpuka Papālinamoku, Hawai'i Volcanoes National Park.

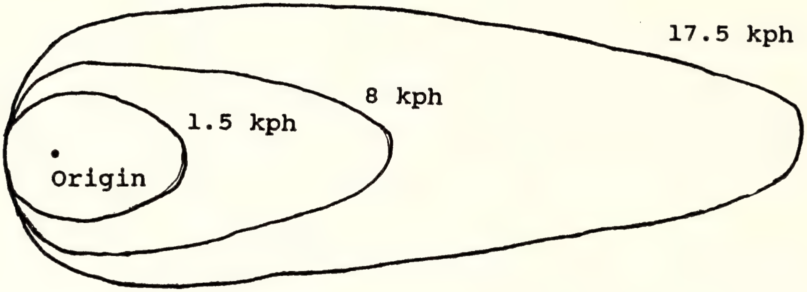

Figure 3. Fire area shapes and points of origin at different wind speeds. (after Rothermel 1983).

Graphic models (Fig. 3) express the relationships among wind speed, fire shape, and points-of-origin (Rothermel 1983). These models indicate that the higher the wind speed, the narrower the ellipse. They also show that the point-of-origin of the fire is at approximately 820 m elevation near the rear of the fire. It is relatively closer to the rear of fires with higher wind speeds. These models imply that the point-of-origin was approximately 300 m from the north perimeter and at approximately 825 m elevation (Fig. 2). The models can be applied if a constant wind speed and direction and homogeneous fuels are assumed.

Predicted rates of spread for the fuel type and conditions are consistent with a point-of-origin near the north perimeter. The rate of spread of the backing fire near the north perimeter was not measured during the wildfire. However, it can be predicted based on fuel models. A fuel model for the bush beardgrass (_Andropogon glomeratus_) dominated fuel type at the north perimeter of the fire is not available. However, a customized fuel model for relatively even mixtures of _A. gloeratus_ and broomsedge (_A. virginicus_) has been developed. Predicted backing rates at wind speeds of 11-16 kph are 15-35 m/hr. The interval between the time of origin of the fire and the time of mapping is not known. However, at the above rates of spread, the fire would have backed 45-105 m at three hours and 60-175 m after five hours. Backing rates predicted by the stylized perennial grass model used on the Mainland are similar.

The distribution of char patterns of tree boles also suggests that the point-of-origin is in the vicinity of that predicted by graphic models. Char is simply charred or blackened bark or wood. Char tends to be highest away from the direction of spread of a fire, that is on the leeward sides of trees because tree boles block the wind which bends the flame at a lower angle than the vertical. Char patterns were consistently higher on the southwesterly sides of the trees below 835 m elevation for the portion of the burned area described in Figure 2. However, no consistent pattern could be observed near the edges of the burn. Therefore, it is not possible to trace the char patterns back to the precise point-of-origin. Local concentrations of fuels beneath trees may play a more important role than fire spread direction in determining char height with flaming and backing fires near the fire perimeter.

Signs of lightning-struck trees

Ten lightning-struck trees were found near the point-of-origin but outside the burned area. The trees occurred in two groups, both approximately 750 m from the probable point-of-origin. One group of trees was on the same contour with the point of origin; the other was 50 m higher in elevation. Lightning strikes were indicated by the predominance of scorched (brown) leaves, charring of the canopy and/or bole, or spiral fracturing of the bole with char present at the base of the bole. All lightning-struck trees had scorched canopies, and all had char in the branches of the crowns. Two had spiral fracturing of the bole with char present at the base of the bole. A small individual of pukiawe (*Styphelia tameiameiae*) near the base of one tree was also scorched. The fire did not spread from these trees, some of which were on pahoehoe with relatively low cover of grass. The freshness of charcoal and scorched vegetation suggested a very recent occurrence of lightning. No other thunderstorms are known to have occurred within several months before or after the September 4 storm. No lightning damage was observed on trees near the probable point-of-origin of the fire. However, essentially all trees in this area were thoroughly scorched, and many were noticeably charred.

Low probability of human ignitions

The probable point-of-origin is approximately 1 km north of the Kïpuka Nënë Trail and 2 km northeast of the Halapë Trail. This area is not used by hunters, hikers, or Park employees. A NPS employee drove on the Kïpuka Nënë Trail but not within the fire perimeter mapped at 1530 h on September 5. Therefore, human ignition seem highly improbable.

DISCUSSION

Lightning as the ignition source of the Uila Fire is consistent with the viewpoint that fire was not an important evolutionary and ecological factor in native Hawaiian vegetation (Mueller-Dombois 1981). Mueller-Dombois (1976) describes the vegetation of the submontane seasonal environment as dominated by widely spaced woody plants and an understory of scattered sedges, lichens, and bryophytes. Fine fuels were not present in this environment and many other Hawaiian environments prior to the arrival of fire-adapted alien grasses. The Uila Fire was carried by fuels composed of alien grasses.

Lightning fires may be becoming more common in Hawai'i. The Uila fire and the recent lightning fires in Kona were associated with "dry lightning" in which little precipitation fell during the thunderstorm. Data on patterns of dry lightning occurrence are not available. The recent thunderstorms with ground strikes and little rain may be anomalous rather than an indicator of a trend. However, it is reasonable to infer that the proliferation of alien grasses may also account for an increase in lightning caused fires. In areas in which alien grasses are increasing, lightning may be responsible for more ignitions. Certainly, the recent lightning fires on the Big Island are a warning that increased detection for fires is needed during and after thunderstorms, especially when rainfall is low and in grassy areas.

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NATIVE HAWAIIAN PLANT SOCIETY

The Native Hawaiian Plant Society is based on Maui. The Society is dedicated to preserving native plants by conducting various stewardship projects. They have on-going projects at Auwahi and Eke on Maui, and Kahoolawe to name a few. They also collect seeds of rare plants and raise them on their preserve on West Maui. Persons interested in joining the Society should send $5 to Native Hawaiian Plant Society, P.O. Box 5021, Kahului HI 96732 or call Peter Connelly at (808) 572-1499.

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HAWAIIAN MUSEUMS ASSOCIATION

The Hawaiian Museums Association has just released a list of affiliated organizations. The booklet lists museums, botanic gardens, etc., and their principal function by island. Forty-one institutions are listed. Copies may be obtained for $2.00 by writing to Hawaiian Museums Association, P.O. Box 23284, Honolulu HI 96822.

DISTRIBUTION OF GORSE (Ulex europaeus L.), A NOXIOUS WEED IN HAWAI'I

George P. Markin
Laurel A. Dekker
Joyce A. Lapp
Roddy F. Nagata

USDA, Forest Service
Pacific Southwest Forest and Range Experiment Station,
1643 Kilauea Ave.
Hilo, HI 96720

INTRODUCTION

Gorse (Ulex europaeus L.), a thorny, perennial shrub in the Papilionideae subfamily of the family Leguminosae (also known as Fabaceae), is a native of Western Europe. Its flowers are fragrant, pea-like and bright yellow. Its hairy seed pods measure about 1.2 mm long (Neal 1965). Mature plants consist of only stems and spines; typical leaves grow only in the juvenile stage (<5 cm tall).

Gorse forms dense, impenetrable stands with up to 60,000 stems per ha. Plants left undisturbed have been reported to be as tall as 7 m (Lee et al. 1980). The prolific flowering of gorse from December through April results in a solid showy mass of bright yellow. The shrub produces hundreds of seed pods on each branch and can scatter seeds almost 6 m as the pods dehisce on a hot dry day (Kennedy and Hyde-Wyatt 1969). Seeds also spread by washing down rivers and in mud clumps carried by animals and machines. Once in the soil, seeds have remained viable for up to 30 years (Moss 1959)

Gorse, deliberately spread by humans is now found in more than 15 countries or island groups around the world (Holm et al. 1979). Originally, it was considered beneficial when used as a hedge, before barbed wire was used for fencing, or as grazing for sheep and goats (Jobson and Thomas 1964; Moss 1960). Gorse inevitably escaped from cultivation in almost every area it was introduced however, and became a serious weed, including in Hawai'i where it has been declared noxious (Hazelwood et al. 1983).

On the island of Hawai'i, gorse was introduced into the Humu'ula area on the south and east sides of Mauna Kea sometime before 1920--possibly as a browse for domestic sheep that were being raised in the area. Sheep were replaced by cattle in the 1950's and with minimal grazing by cattle, it grew extensively. The first chemical attempt at its control was conducted on isolated patches along the Saddle Road (Highway 20) in 1957. A major chemical control program covering over 2,500 ha was started in 1976 and was declared successful by 1978. While most accessible plants apparently were killed during this program, regeneration from seeds in the soil quickly replaced the original plants.

On Maui, gorse is mostly concentrated in the Olinda area of the Haleakalā Homesteads, an area of small farm lots located above the community of Makawao. Gorse may have been introduced into this area as a hedgerow before 1901 (Degener 1975). The story persists that a Scotsman in the area who was homesick for his native country, planted a hedge of gorse in the early 1900's. Workers at Haleakalā Ranch claim that they recognised gorse as a weed before 1940, and since then have conducted a yearly control program. At Olinda, a prison camp was established in the mid-1950's and operated for many years as a source of labor for gorse control in the surrounding area (Degener 1975).

Despite several attempts at control, gorse is still well established on both Maui and Hawai'i, and in 1987 the State Legislature approved additional funds for a renewed effort at control. In Hawai'i, gorse has long been recognised as a major weed and numerous efforts at its control have been made or are underway, but the area of its infestation has never been surveyed or mapped. Without this base-line information, however, it is unkown if the present infestation is stable or continuing to spread, and it is impossible to determine the effectiveness of any program.

A study to determine the present distribution of gorse on the islands of Hawai'i and Maui was undertaken from 1984 to 1987. A review of unpublished state records, interviews with land managers, and limited ground and aerial surveys were made.

METHODS AND MATERIALS

When available, State weed control records for earlier control attempts were reviewed, along with interviews of weed control workers who were involved. Other sources of information included were National Park Rangers at Haleakalā Park on Maui, Hawai'i Department of Lands and Natural Resources Foresters, and ranch managers for the Haleakala and Parker Ranch. Reported infestations were marked on U.S. Geological Survey, quadrangular maps. We first concentrated on identifying the farthest population in order to delimit the outer perimeter of the infestation. We attempted to visit each population, and to survey the surrounding area by using 4-wheel drive vehicles, by foot, and--on the island of Hawai'i--by helicopter, to verify that these formed the outlying margins of the infestations. On Maui, many of the outlying pockets had been eliminated with herbicides, and no evidence of them remained. If we considered the reports of such pockets reliable, based on the reputation of the observer (usually State Weed Control workers or foresters), we included the pockets on the map as part of the infestation area, since seeds are probably still in the soil and could germinate anytime over the next 20 to 30 years (Moss 1959).

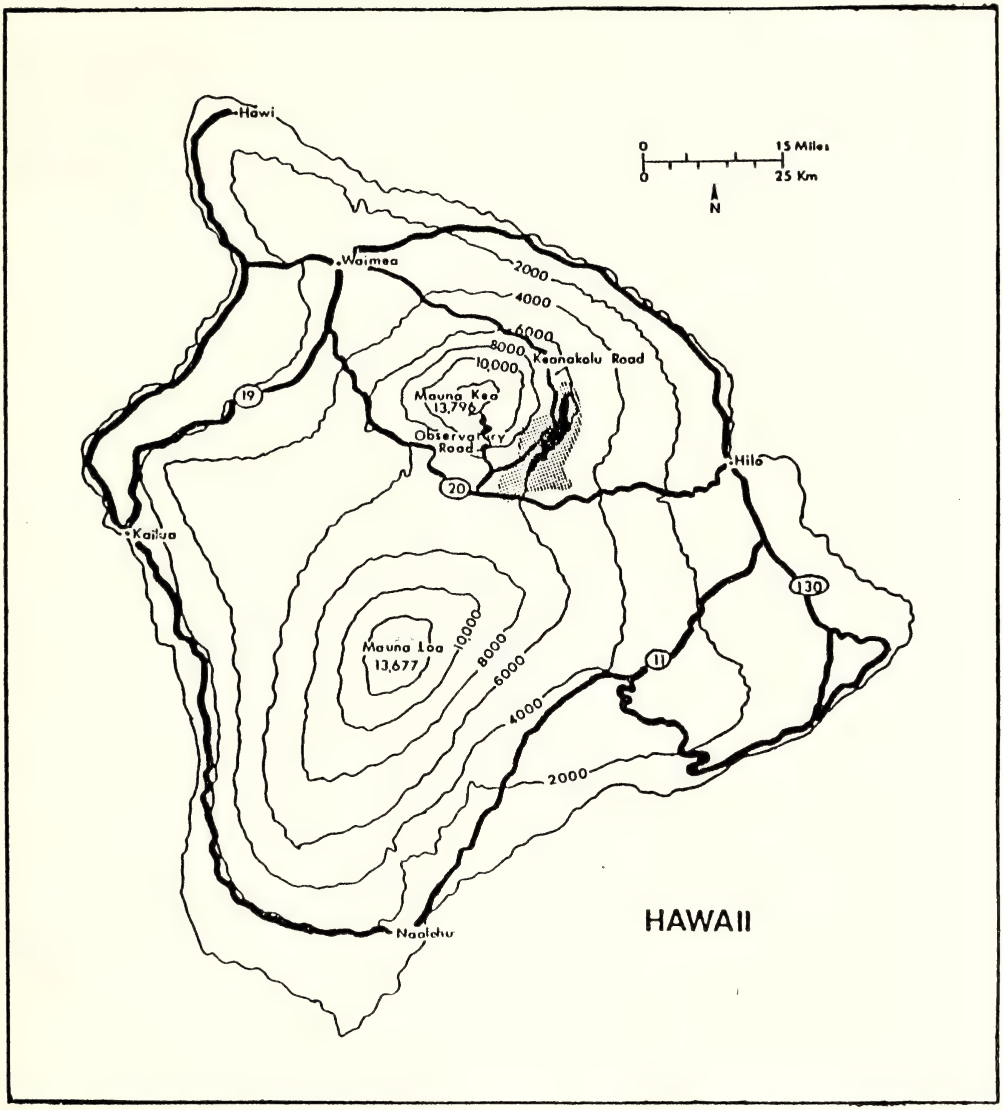
Reports of isolated plants that had been destroyed when found were not included on our maps, since most had been destroyed before many seeds would have been produced. Additional surveys were conducted, as time and other work allowed, to plot the density of the gorse within the area of general infestation. In general, surveys were conducted from January to April when the flowers were in full bloom and the vivid yellow blossoms allowed easy identification of isolated plants at a long distance.

When the outermost pockets, or live isolated plants, of gorse had been verified and plotted on the map, a general peripheral line was drawn connecting them. This outer boundry was estimated to indicate the overall range of gorse, even though through much of the area the density of plants near the periphery was probably as low as one plant per 100 ha. Within this overall area of distribution, a second boundary was drawn indicating the areas of continuing distribution which contained plant density ranging from 1 or more plants per hectare up to total ground coverage. Once plotted, a planimeter was used to determine the size of the area of continuous distribution, and the total areas of probable distribution.

RESULTS

As of spring of 1987, the infestation on the island of Hawai'i was generally in an elongated band stretching from the edge of Saddle Road (Highway 20) near mile marker 26 and paralleling the Keanakolu Road for 24 km (15 miles) (Fig. 1). The Keanakolu Road runs from near the Humu'ula Sheep Station around the south and east side of Mauna Kea to the old ranger station at Keanakolu and eventually on to Waimea. Gorsed plants were most abundant along this road, starting 6.7 km in from its origin above the Humu'ula sheep station to 22.5 km. The lower boundary of the gorse infestation was generally the edge of the forest lands. Along the Wailuku River drainage, plants were found down to as low as 450 m (1,480 ft.) near the water intake of Hilo. The upper edge of the gorse infestation was generally near 2,250 m (7,380 ft.) elevation line on Mauna Kea, but isolated patches of gorse were found up the Wailuku river drainage at 2,400 m (7,870 ft.) in elevation.

The total area of probable distribution, excluding isolated plants which may extend down the watershed into the forest reserves, was estimated at 8,262 ha (20,415 acres) of land, with an inner block of continuous distribution where most of the gorse was found on 2,509 ha (6,200 acres).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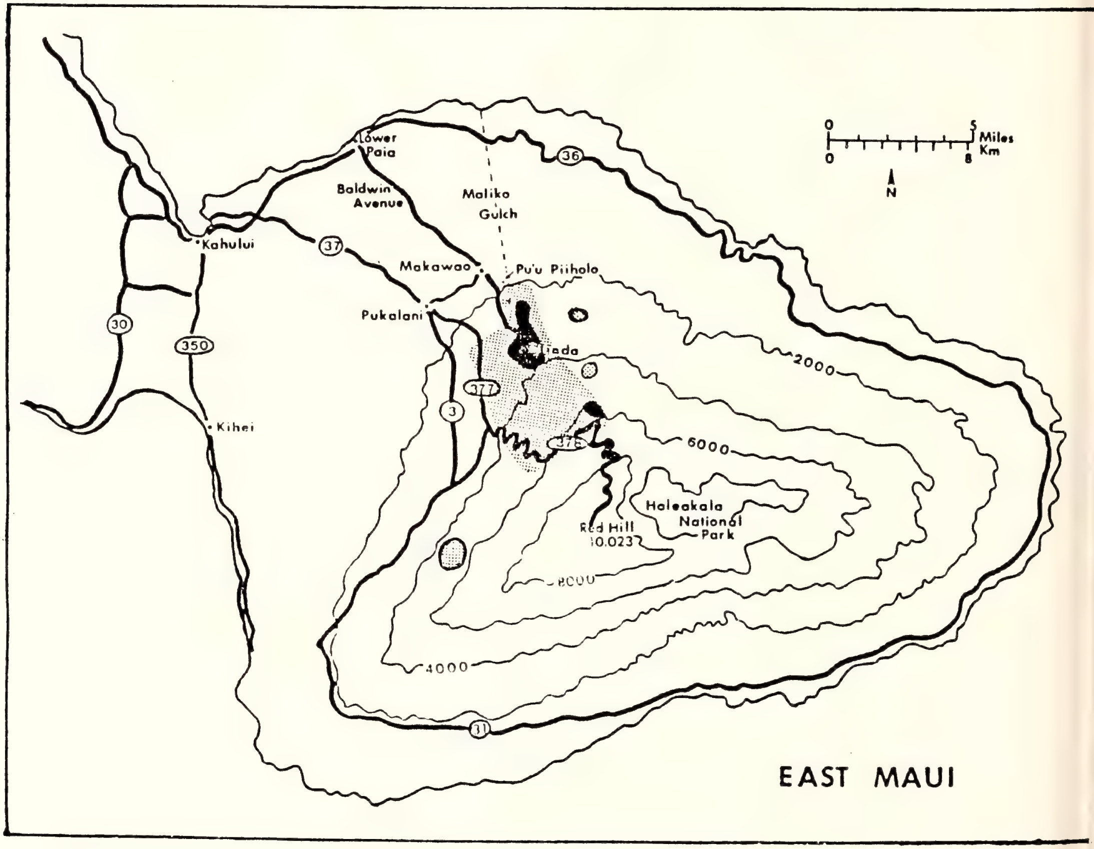
HAWAII

Figure 1. Gorse infestation areas on the island of Hawai'i are indicated by shading (sparse) and solid-fill (abundant). Contour lines at 2,000 ft. (610 m) intervals.

On Maui, the infestation was more regular in shape (Fig. 2), the northernmost part of the infestation was at 630 m (2,070 ft.) elevation, near Pu'u Pi'iholo southeast of the community of Makawao. The east edge was approximately the boundary between the Makawao and the Ko'olau Forest Reserve on a line that runs to the edge of Ko'olau at 2,220 m (7,280 ft.) elevation--the highest point ·gorse was found on Maui-- at the boundary of Häleakala National Park. The northernmost point of the Haleakala National Park, including Hosmer Grove and the Park Headquarters, were also included in the gorse infestation. The southwest border was generally a line above Highway 378, to a point 2 km south of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Haleakala National Park
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8000
4000
31
EAST MAUI

Figure 2. Gorse infestation areas in east Maui are indicated by shading (sparse) and solid-fill (abundant). Contour intervals set at 2,000 ft. (610 m).

the switchbacks. The west edge of the infestations generally paralleled Highway 377 down to the 750 m (2,460 ft.) level, then crossed back to Pu'u Pi'iholo area.

The inner core of continuous distribution was smaller than that on Mauna Kea, probably representing continuous efforts of the Haleakalä Ranch on the south and west to keep it contained. The densest stands were found within a half-mile radius of the Olinda State facility located at about 1,075 m (3,530 ft.) elevation, an area with extensive urban development. A tongue of gorse also extended north on private land along the west edge of the Makawao Forest Reserve down to about 630 m (2,070 ft.). The patch of gorse located at 630 m was the lowest continuous stand of gorse found in the survey. From this area, the Mäliko Gulch extends down to sea level, and isolated plants have been reported down this gulch including several on the beach at Mäliko Bay itself. A second stand of continuous gorse was found in the area of Hosmer Grove just north of the Haleakala Park Boundary.

A pocket of plants has also been reported in the Kula Forest Reserve between 1,220 to 1,830 m (4,000 to 6,000 ft.) elevation, and two small infestations were reported (1 to 3 km) east of this general infestation within the Koolau Forest Reserve. While we could not locate any of these pockets, they were probably large enough and old enough so that a seed bank would have accumulated in the soil. And even if these pockets have been eliminated, regeneration can be expected at any time.

Additional isolated plants were reported outside the primary infestation area: 1) in the Kahikinui Forest Reserve at 2,135 m (7,000 ft.) elevation; 2) at Kahakuloa in West Maui at 90 m (300 ft.) along roads constructed by the Olinda Correctional Facility crews, and one plant on Häna Mountain in Haleakalä National Park at about 2,440 m (8,000 ft.) elevation. All of these isolated plants were eradicated as soon as they were found and before seeds had been produced.

Overall the total area of gorse infestation on Maui was estimated to be 5,985 ha (14,789 acres). The areas of continuous distribution including both the patch at Hosmer Grove and the area around and north of Olinda, totalled 517 ha (1,277 acres).

Rainfall records for both areas where gorse is found are sparse, but Parker Ranch workers report that Humu'ula Sheep Station receives less than 122.5 cm of rain a year while NOAA records indicated that Olinda State facility receives more than 400 cm a year. We found that gorse had not extensively invaded undisturbed native forest, but where forests had been opened and the underbrush removed by grazing, gorse could be found under the tree canopy. Also on Maui where the Makawao Forest Reserve had at one time apparently been cleared and replanted with introduced species of trees, we found gorse scattered in open areas and along access roads.

On Maui, our interviews with State Weed Control workers indicated that gorse has not extensively expanded its range in the last 10 or 20 years, probably due to continual containment efforts of the Haleakalä Ranch, Haleakalä National Park, and Hawai'i Department of Agriculture. On Hawai'i, however, during the 3 years of the survey, we noticed that new gorse plants could be found at 1 to 2 km north of the earlier boundary. In this direction pastures or open grazed forest lands continued along the east slope of Mauna Kea and appear to be ideally suited for gorse. Gorse will probably continue to advance in this northerly direction, unless containment measures are taken.

SUMMARY

A survey conducted between 1984 and 1987 indicated that gorse is restricted to about 8,262 ha (20,415 acres) on the island of Hawai'i, and to about 5,985 ha (14,789 acres) on the island of Maui. Continuous stands ranging from at least one plant per hectare to total coverage by gorse averaged only 2,500 ha (6,200 acres) on the island of Hawai'i, and 517 ha (1,277 acres) on the island of Maui. The greatest abundance of gorse occurs at elevations from 630 m (2,070 ft.) to 2250 m (7,380 ft.), where rainfall ranges from 122 cm to more than 400 cm.

ACKNOWLEDGMENTS

We thank Guy Nagai, Edward H. Tamura, and Myron Isherwood, Hawai'i Department of Agriculture; Ernest Pung (retired) and Wesley Wong, Hawai'i Department of Lands and Natural Resources; Mike Banfield, Haleakala Ranch; James Spencer, formerly of Parker Ranch; and Ron Nagata, Russ K. Hart, Haleakala National Park for their assistance on this study.

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HAWAIIAN BOTANICAL SOCIETY
Minutes of the January 1988 Meeting

The meeting was called to order at 7:30 p.m. by President Wester. The minutes of the December meeting were read and approved. The treasurer reported expenditures for December as $1045.92, leaving a balance at the end of December of $2790.66.

Under old business, the recommendation to donate $1000 towards the purchase of the Moomomi tract by The Nature Conservancy Hawaii was approved by the Trustees and the check sent.

Under new business, Sy Sohmer mentioned the upcoming NSF sponsored workshop to plan a comprehensive flora of the Philippines. He also mentioned that one participant, Dr. Peter Aston, was giving a public lecture January 14, at 7:30 p.m., entitled "Thirty years of wandering through the forests of Borneo."

We had two "Plant of the Month" speakers. Steve Perlman finished up his "Recent Plant Finds" with some beautiful slides from East Maui, and Marie Bruegmann showed some slides of the Marsilea population in Koko Head in years past, and the potential in the near future after the recent rains.

Dr. Harold St. John was speaker of the month and his talk entitled "Recent Botanists in Hawaii." It was an informative and very interesting talk about botanists from the early to mid 1900's. We were entertained with personal histories and amusing anecdotes about people most of us have only read about.

The meeting was adjourned at 9:00 p.m. and refreshments were served.

Respectfully submitted
Maria Leu, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes of the February 1988 Meeting

The meeting was called to order by President Wester at 7:30 p.m. The minutes of the January meeting were read and approved. The Treasurer reported a balance brought forward of $2806.23.

Under old business, there was a progress report on the Marsilea project. The plants were growing well and reproducing, and most invading weeds were dead from being underwater. Twenty people showed up to help construct barriers to keep out four-wheel drive vehicles. On February 20, a Geography class field mapped the weeds. There was a call for volunteers to monitor the condition of the barriers and re-establishment of the weeds.

In past years, the Botanical Society has been involved in providing judges and prizes for the High School Science Fairs best Botanical entries. A motion was proposed and approved for providing awards of $50 and a book for each of the 3 winners.

Under new business, Dr. Clifford Smith sent a letter to the Society voicing his concern about two endangered populations of plants. A colony of Scaevola coriacea has been destroyed by a housing development in Waiehu and the Bishop Estate's koa silviculture program is encroaching on known habitat of Vicia menziesii. He asked the Society to send a letter to the Governor expressing our concerns. The secretary drafted a letter from the Hawaiian Botanical Society expressing our concern.

The "Plant of the Month" speaker was John Obata who enlightened us about Hawai'i's native orchids which are not as showy as their horticultural cousins. Loren Gill gave us an impromptu update on an experimentally successful method of controlling Clidemia hirta using a fungus from Panama.

Speaker of the month was Dr. Sam Gon III whose topic was the "Happy faced spiders of the Hawaiian forests." It was an interesting and entertaining talk with many beautiful slides illustrating the reason for the name "happy faced spiders."

The meeting was adjourned at 9:00 p.m. and refreshments were served.

Respectfully submitted
Maria Leu, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes of the March 1988 Meeting

The meeting was called to order by President Wester at 7:30 p.m. The minutes of the February meeting were read and approved. The Treasurer reported a balance brought forward of $4088.83.

Under old business, President Wester proposed a committee be formed to plan a strategy for weed control at the _Marsilea_ population in Koko Head.

Under new business, Dr. Abbott announced that she will write a short article for the _Newsletter_ about the recent death of Dr. Otto Degener. Also under new business, Steve Montgomery asked the Hawaiian Botanical Society to contribute $250 for the replacement of the posters in a National Wildlife Week educational packet to ones more relevant to Hawai'i. A motion was proposed and approved to contribute $250 to replace the posters.

Dr. Abbott mentioned that the money the Federal Government provided for feral animal fences at Haleakalä in the past has been line-item vetoed out of this year's budget. She proposed that a letter be written to our Senators asking them to keep these funds because the money spent in years past will have been a waste if there is no money for continued upkeep. The motion was approved, and a letter was drafted and sent.

"Plant of the Month" speaker was Joel Lau. He spoke about _Flueggea neowawraea_ one of Hawaii's most endangered plants. It is a massive trees of xeric and music forests. There is a sizable population in Waimea Canyon and collected seeds for cultivation.

Speaker of the month was Bill Garnet with the Center for Plant Conservation and Waimea Arboretum and Botanical Garden. He told us about the work the Center is doing to conserve some of the most threatened plants of the world through cultivation. He had some slides showing the methods employed. He also explained efforts at plant conservation undertaken at Waimea Arboretum and Botanical Garden. They have a nursery area for growing plants and 34 gardens that represent different areas.

The meeting was adjourned at 9:00 p.m. and refreshments were served.

Respectfully submitted
Maria Leu, Secretary

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
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Newsletter Hawaiian Botanical Society

VOLUME 27(4) DECEMBER 1988

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1988

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CALOTROPIS PROCERA (Asclepiadaceae): A NEW WEED IN HAWAI'I

George K. Linney
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
HONOLULU HI 96822

In the forthcoming Manual of the Flowering Plants of the Hawaiian Islands only two exotic milkweeds are treated at length as naturalized in Hawai'i. In fact at least two other species of the family are well established here: Cryptostegia madagascariensis and Calotropis procera. The first of these is treated by Smith (this volume) elsewhere, so this paper will be restricted to the latter.

Calotropis is a genus of about six species from Africa and Asia. Two species, C. gigantea from India to Indonesia and procera from India to Africa, are grown in Hawai'i. Both are small trees to about fifteen feet tall and prefer dryish conditions. Calotropis gigantea is very common as a garden ornamental and lei flower. Flowers are either white or bluish-purple. Winona Char reports that it has been planted on Kaho'olawe, and is persisting. Despite its wide-spread cultivation, it has not been observed to set seed here. Calotropis procera was previously known to be grown only at Foster Botanic Garden in Honolulu. It is distinguishable from C. gigantea in features of the flower as well as the texture of the bark of trunks and larger branches. Petals of C. procera are broadly tipped with reddish purple. While C. gigantea has petals that lie flat or recurve somewhat, the petals of C. procera are more or less cupped. The "crown" of C. gigantea is rather taller than that of C. procera. In the former it seems too big for the flower; in the latter it is more in proportion to the rest of the flower. The bark of C. procera is much more deeply furrowed than that of C. gigantea, which is almost smooth. Plants of C. procera may be found in flower and fruit all year-round. Fruits look something like green mangoes, a bit over four inches long, but are inflated-bladder-like. Seeds are borne in a small, spindle-shaped inner chamber. At maturity, the fruit opens along a single suture and the seeds are shed. A plume attached to each seed assures effective dispersal by wind. Seeds are very common on the lava fields even when parent plants are no where in sight.

Calotropis procera is widely distributed on the lava fields of North Kona and South Kohala from about one mile south of the entrance to Keāhole Airport northward to Puakō at least, a distance of about twenty miles. It scarcely reaches above Queen Ka'ahumanu Highway. Distribution may be determined by prevailing winds, but is probably influenced by rainfall. The plants have not established in areas with much more than ten inches of rainfall annually. It may be that the heavier vegetation (e.g., fountain grass, Pennisetum setaceum) in wetter areas prevents establishment of seedlings. From the greater size and higher density of plants, it appears that the population may have arisen somewhere in the vicinity of the airport. There are some lei-flower plantations nearby, but Calotropis procera is not currently grown there while C. gigantea is. It is possible that C. procera was formerly cultivated there and escaped.

This species is not likely to become a pest, since it seems to prefer lava fields now largely devoid of woody plants in general and native plants in particular. Formerly 'ohai (Sesbania tomentosa) would have exploited these situations, as pua-pilo (Capparis sandwichiana) and noni (Morinda citrifolia) do now. They will most likely remain curiosities on these otherwise largely barren plains.

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BIBLIOGRAPHY OF PLANT CONSERVATION IN THE PACIFIC ISLANDS: ENDANGERED SPECIES HABITAT CONSERVATION, INTRODUCED BIOTA.

In the thorough and useful tradition of M.-H. Sachet and F. R. Fosberg's Island Bibliographies (1955, 1971), this new bibliography (Defillips, Robert A. 1987. Atoll Research Bulletin 311: 195 pp.) builds on the foundation of that work and brings entries up to date (May 1987) in its subject areas.

Its geographical reach spans the tropical Pacific from the Galapagos and Juan Fernandez Islands, Cocos and Clipperton in the east, to the Ryukyus and Bonins, Bismarcks and Admiralties in the west. It includes Norfolk I. and Lord Howe I. but stops short of New Guinea, the Phillipines, Japan and New Zealand.

The index includes headings for individual islands and archipelagoes, and 32 subjects, conveniently arranged. This is one bibliography that everyone interested in plant conservation in the Pacific Islands should know about and use.

Bryce Decker, Geography Department, University of Hawai'i.

CRYPTOSTEGIA, A POTENTIAL PROBLEM IN HAWAI'I

Clifford W. Smith
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
Honolulu, Hi 96822.

During the recent Exotic Plant Pest Conference in Miami, Dr. Rachel McFadyen from the Alan Fletcher Research Station, Queensland, Australia reported on the serious problems created by the rubber vine (*Cryptostegia grandiflora*, Asclepiadaceae). This species, originally from Madagascar, infests over 30,000 sq km forest in Queensland with an average rainfall between 500-1200 mm. It forms impenetrable blankets of vine much like the banana poka infestation at Laupahoehoe.

St. John lists both species of *Cryptostegia*, viz., *C. grandiflora* (Indian rubber vine) and *C. madagascascariensis* (Madagascar rubber vine), in Hawai'i. However, the new Manual of the Hawaiian Flora does not treat this genus presumably because the authors were unaware that it has become naturalized. Since neither species is treated in the new flora the following table can be used to distinguish between them.

	C. grandiflora	*C. madagascariensis*
Flower color	White to pale purple	purple
Color of main veins on leaf undersurface	purplish	green
Coronal glands (may be confused as stamens)	bifurcate	simple

There are no native species in the Asclepiadaceae. Four genera of the thirteen introduced have naturalized, viz., *Asclepias* (milkweed and balloon plant), *Calotropis* (crown flower), *Cryptostegia* (rubber vine), and *Stapelia* (carrion flower). They can be readily distinguished just by growth form. Milkweed is a herb, crown flower a shrub, rubber vine a vine, and carrion flower is cactus-like.

Dr. George Linney reports that contrary to the situation described by Dr. McFadyen, the Madagascar rubber vine has escaped on O'ahu, not the Indian rubber vine. It may be found at Barber's Point Naval Air Station and Lahilahi Point. The Indian rubber vine prefers mesic environments. The fact that it has not escaped to date should not allow us to relax about this species. Its rampant growth in Australia, New Caledonia, Curacao and Vanuatu suggest that we should perhaps act now to eradicate this species from gardens and other areas and not wait and see.

Dr. McFadyen briefed the conference on some insects and a rust that were being evaluated as biocontrol agents.

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NEW BOOK

CONSERVATION BIOLOGY IN HAWAII edited by Charles P., and Danielle B. Stone. University of Hawaii Cooperative National Park Resources Studies Unit. Distributed by UH Press. $16.

This book of short essays (titles listed below) on the conservation of natural areas in Hawai'i is "directed at educators, decision-makers, and those interested in Hawaii and the quality of island life."

Hawaii's Uniqueness
  Island Ecosystems. Uniqueness of Hawaii's Biota. The Volcanic Origin of the Hawaiian Islands. Soils in Hawaii
Plant Life
  Vegetation Zones of the Hawaiian Islands. 'Ohi'a Dieback and Forest Life Cycles. Plant Taxonomy in the Hawaiian Islands. Rare Plants and The Federal Endangered Species Act. Botanic Gardens for Plant Conservation. Non-Native Plants. Alien Plant Management by Biological Control.
Animal Life
  Native Terrestrial Invertebrates. Non-Native Invertebrates. Non-Native Land Vertebrates. Native Birds. Captive Propagation of Birds.
Biological Diversity and Special Communities
  Biological Diversity and Its Loss. Gene Pool Conservation. Hawaii's Wetlands, Streams, Fishponds, and Pools.
Problems, Planning, and Protection
  Controlling the Flow of Non-Native Species. Tourism. Biological Databases for Preserve Selection. Vegetation Mapping. Land Use Planning and Priorities in Hawaii. Protection of Natural Habitats.
Conservation Education
  Perspectives on Environmental Education in Hawaii. Conservation Education in Hawaii: History, Problems, and Needs. Conservation Education: Techniques and Targets. What Do Classroom Teachers Need to Teach Conservation Education in Hawaii? Using the Public Media for Conservation Education.
Values and Ethics
  Hawaiian Conservation Values and Practices. Outdoor Ethics in America. Humanity's Responsibility for Future Life. Priorities in Paradise: The Value of Conservation. Education in Hawaii

HAWAIIAN BOTANICAL SOCIETY
Minutes of the April, 1988 Meeting

President Wester called the meeting to order at 7:30 p.m.. The minutes of the March meeting were read and approved. The Treasurer reported that the balance brought forward was $3996.56. There was no old business.

Under new business the following new members were proposed and elected:

Dr. & Mrs. Bruce Clarkson, visiting the Botany Department, University of Hawaii.
Dr. Ronald R. Weedon, Charon State College, Nebraska.
Dr. David H. Lorence, Pacific Tropical Botanic Garden.
Charles Y. Nagamine, Departments of Agricultural Biochemistry and Horticulture, University of Hawaii.
Olive Vanselow, Ho'omaluhia Botanic Garden.

Plant of the month speaker was Heidi Bornhorst who told us how to grow Marsilea in our backyards.

Speaker of the month was Andy Engilis whose talk was entitled "Hawaiian Forest Birds." He concentrated on the birds found in the Hanawī area of Maui, especially the endemic Honeycreepers. He had many beautiful slides and showed us how the plants and birds are dependent on each other.

The meeting was adjourned at 8:45 p.m. Members then enjoyed refreshments.

Respectfully submitted
Maria Leu, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes of the May 1988 meeting

The meeting was called to order at 7:30 p.m. by President Wester. The minutes of the April meeting were read and approved. There was no Treasurer's report.

Under old business, the winners of the Hawaiian Botanical Society science fair awards were Dianella Horvath of Moanalua Intermediate School in the open division, Loreen Sato of Castle High School in the senior division, and Benjamin White of Mid-Pacific Institute in the junior division.

Under new business, the membership committee proposed two new members, Michael Huddleston and Warren Wagner. The proposal was seconded and passed. Also under new business, a motion was made to consider contributing money to the Bishop Museum's Fatu Hiva expedition. It was seconded and passed. The Officers will inform the Trustees of the memberships' wish to contribute money.

Plant of the month speaker was Dianella Horvath who brought her award winning science fair project entitled "Reproduction in Scaevola sericea."

Speakers of the month were Drs. Steve Montgomery and Wayne Gagné who spoke about the natural history of the Marquesas. They focused on Fatu Hiva and the importance of an in-depth study of the flora and fauna.

The meeting was adjourned at 9:15 p.m. Refreshments were served.

Respectfully submitted
Maria Leu, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes of the June 1988 Meeting

The meeting was called to order at 7:30 p.m. The minutes of the May meeting were read and approved. The Treasurer reported that the balance at the end of May was $3722.88.

President Wester regretfully announced the death on May 24, 1988 of Dr. Wayne Gagné. He was an active member of the Society and served as the Secretary in 1972-73 and chaired the Conservation Committee.

Under old business, the Trustees met and voted to contribute $500 to the Fatu Hiva expedition in memory of Dr. Wayne Gagné.

An update on the Marsilea project reported the plants healthy and the off-road vehicle barriers doing their job. Permanent signs were also installed. A major report on the Marsilea project was published in the last issue of the Newsletter.

There was no new business.

Plant of the month speaker, Toshi Ikagawa, talked about koa haole (Leucaena leucocephala). His interesting and entertaining talk suggested some reasons contributing to its recent decline.

Speaker of the month was Dr. Arthur Whistler of the Pacific Tropical Botanical Garden. His talk was entitled "A botanical tour through the kingdom of Tonga." He had many beautiful slides showing the variety of plant life to be found in Tonga.

The meeting, followed by refreshments, adjourned at 9:15 p.m..

Respectfully submitted
Maria Leu, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes of the October 1988 Meeting

The meeting was called to order at 7:30 p.m. About 40 members and guests were present. The June minutes were read and approved, with the May balance of the Treasurer's Report corrected to $3,722.88. The Treasurer reported a balance of $3,566.27.

The President reported the appointment of the Nominating Committee for 1988: Steven Perlman (Chair), Bryce Decker and Donald Drake.

Candace J. Lutzow, nominated by the Memberhip Committee, was elected a member. She is a doctoral candidate in Ethnobotany. The Committee also noted Dr. Sheila Conant is now a Life Member.

The President noted a letter of thanks to the Society from the Bishop Museum for the gift in support of the Fatu Hiva Expedition in memory of Dr. Wayne Gagné.

There was no new business.

The speaker of the evening was Society Vice-President Steven Perlman whose topic was "Plant Collections of the Fatu Hiva Expedition." The expedition, of which Mr. Perlman was a member, sailed to the Marquesas on Mr. E. Carrus' vessel "Aeolus," and spent several months visiting some of the Islands. Several thousand specimens were obtained, including new species of Cyrtandra, Bidens, Pelea, Psychotria, and of the recently described new genus Plakothira, among others. The Expedition took time for a brief memorial service conducted by Betsy Gagné for her late husband, near the area where they had found Oxalis gagneorum on a previous expedition. Mr. Perlman's slides illustrated the natural beauty of the Marquesas beautifully but also showed considerable physical hazards to collectors of plants and insects. The dangers were due to the precipitous nature of the terrain in the areas not well-studied previously, and in which the most new material could be found.

Following this most interesting presentation, the meeting adjourned for refreshments at 8:50 p.m.

Respectfully submitted
for the Secretary
Donald P. Gowing

HAWAIIAN BOTANICAL SOCIETY
Minutes of the November 1988 Meeting

The meeting was called to order at 7:30 p.m. About 30 members and guests were present. The October minutes were read and approved. The treasurer reported a balance of $3,570.33.

The membership committee proposed three new members, Patti Welton, Dr. Ron Fenstemacher and P. David Dewenter. All were welcomed to the Society.

Dr. Bryce Decker reported the selection of the Nominations Committee as follows:

President	Dr. Mark Merlin, General Science UHM
Vice-President	Marie Bruegmann, The Nature Conservancy Hawai'i
Secretary	Patti Welton, Botany UHM
Treasurer	Dr. Derral Herbst, U.S. Fish & Wildlife Service
Directors	Dr. Lyndon Wester, Geography UHM (retiring President) Dr. Isabella Abbott, Botany UHM.

The speaker of the month was Dr. Bruce Clarkson, Botany Division, Department of Scientific and Industrial Research, New Zealand. His talk was entitled "An introduction to the flora and vegetation of New Zealand." Dr. Clarkson had many slides showing the different plant types and habitats encountered in New Zealand. There are about 2,285 native vascular plants. Approximately 15% of the vascular flora is yet to be officially named. One interesting point was that about 75% of the genera are shared with Australia yet some of the major groups such as _Eucalyptus_ and _Melaleuca_ are not represented in New Zealand.

The meeting adjourned for refreshents at 8:00 p.m.

Respectfully submitted
Maria Leu, Secretary

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NOTES ON WEEDS IN HAWAI'I - 1

This article begins a series of notes on weeds in Hawai'i. In the past, the _Society_ has concentrated its efforts on our unique native flora. We have bemoaned the invasion of alien species but done little to respond to this threat to our island heritage. These notes are intended to keep the membership abreast with the problems created by these plants, potential new threats and measures that can or should be taken to prevent their further spread. Please support our effort to become more aware of the threat of these plants by calling Cliff Smith (948-8218) or writing a note (c/o Department of Botany, UH) on range extensions, new records, observations of impacts, control techniques, and any other information you may consider relevant.

Melastomataceae

During a recent survey of Pu'u o Umi Natural Area Reserve, Kohala, Hawai'i, Ken Nagata pointed out that Tibouchina herbacea had become established along the trail. First collected in 1979 along the Saddle Road, this plant has spread rapidly on the Big Island (Nagata, K. M. 1987. Observations on some adventive species in the Hawaiian flora. Bishop Mus. Occ. Papers 27:126-131.). It has also been collected on West Maui.

Clidemia hirta was recently reported from Läna'i by Alan Holt. He and Peter Connally "found two plants at the very beginning of the Hauola north trailhead within 20 feet of the Munro trail jeep road." Betsy Harrison-Gagné reports that this pest was also found in Kīpahulu Valley recently by a National Park Service research team. All were destroyed immediately.

Betsy reports a single plant of Miconia calvescens (Melastomataceae) growing at Alii Gardens, Nahiku, Maui. Society members may wish to let the Gardens staff know the grave threat this plant poses for wet to mesic natural areas on Maui.

Evangeline Funk reports that Oxyspora paniculata is now established along Wa'ahila Ridge. Two plants were observed; one was destroyed, the other was inaccessible. They were both close to the trail just beyond Woodlawn.

Ferns

Betsy also reports that the Cyathea australis infestation in Kīpahulu Valley is much more extensive than previously thought. Trees up to 25 feet tall are now known from three areas in the Valley.

A note dated February 22, 1988, in response to Dr. Evangeline Funk's article in the Newsletter Vol. 26(3), from John C. Elliott, 2100 Huntington Drive, Suite 7, San Marino, CA 91108: "I have several Angiopteris evecta growing at my house in Muolea near Hana on Maui. They are more than 15 years old and I have given divisions of them to several people in the Hana neighborhood. I have never noticed any tendency of these to escape cultivation so far. The plants were originally bought for me at a Foster Garden plant sale. My garden was laid out by Hubbard and Weissich."

Evangeline reports Angiopteris well-established in many of the canyons almost to the ridgetop along Wa'ahila Ridge, O'ahu.

Clifford W. Smith, Department of Botany, University of Hawaii.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
HONOLULU HI 96822

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MEMBERSHIP

The Society year is from December 1 through November 30 of each year.

Regular Membership is $7.50 per year.
Student Membership $4.00.
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Life and Honorary Members pay no further dues.

STATUS OF CLIDEMIA HIRTA ON HALEAKALĀ.

Art C. Medeiros[1], Robert W. Hobdy[2], and Lloyd L. Loope[1]

By 1987, the immense rain forest of Kīpahulu Valley, Haleakalā National Park was fenced, separating the valley into management units which allow the effective reduction of feral pigs. With continued control of pigs and fence maintenance, the prospects for the recovery of native vegetation from pig damage appear promising. However, future invasion of the aggressive shade-tolerant alien plant Clidemia hirta into Kīpahulu Valley could pose a near insurmountable management challenge. Current biological control research against Clidemia is promising, but as yet cannot be counted upon to succeed (see page 11).

There are two established Clidemia populations on East Maui, both on the wet, stream-dissected northern slope. One occurs at Makapipi (Nāhiku quadrangle) and another near O'opuola drainage (Ke'anae and Ha'ikū quadrangles).

The Makapipi population was discovered in December 1977 in the Nāhiku district in Makapipi stream along a hunters' trail at ca. 1500-1620 ft. (460-490 m) elevation. Searches of adjacent dranages in the late 1970's revealed a small population primarily along stream courses. As of 1989, the known Makapipi population consists of dense stands over an area of at least 75 acres (30 ha) and may be much larger.

In August 1980, a second Clidemia infestation (at that time scattered over 5 acres, or 2 ha) was discovered between O'opuola and Makanali drainages in the Makaīwa district of northern East Maui, along a ridgeline trail at 1500-1800 ft. (460-550 m) on lands owned by the State of Hawai'i and East Maui Irrigation Company (EMI).

By 1982, the perimeter of the O'opuola Clidemia population enclosed an area of about 50 acres (20 ha). By 1988, the population had spread from O'opuola to adjacent drainages within an area of nearly 3000 acres (1200 ha). By late 1988, Clidemia seed had been carried downstream and established along the main Hāna highway in four drainages, Ka'aiea, Makanali, O'opuola and Pā, at ca. 700 ft. (210 m) elevation.

Despite early efforts by Maui Division of Forestry and Wildlife to pull plants, by 1982 these populations had increased so rapidly that mechanical control methods were abandonned.

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[1] P.O. Box 369
Haleakala National Park
Makawao HI 96768

[2] Division of Forestry
P.O. Box 1015
Wailuku HI 96793

Clidemia is being efficiently dispersed by fruits carried in irrigation ditch water in a downhill, westerly direction.

The threat posed to Haleakalā National Park by Clidemia was accented by the recent discovery of a single Clidemia plant along a trail at 2800 ft. (850 m) in Kīpahulu Valley in October 1988 (L. Cuddihy and G. Santos 2240). The location of this single plant is quite alarming. Because there were no other Clidemia plants in the area and the single individual was located near a trail, it is assumed that it was dispersed there in mud on the boots of a hiker, possibly someone involved in park management or research. The greatest possible care should be taken to prevent the establishment of this disruptive weed in more pristine protected rain forests of East Maui and throughout the Hawaiian Islands.

****

ANGRAECUM SCALE ALERT

In 1980 the Angraecum scale (Conchapsis angraeci Cockerell) was reported on Pittosporum arborescens in Hawai'i. The scale has a relatively wide host range but is only a serious pest on one or two genera. Hibiscus, orchids, pittosporum and seagraps appear to be affected most. It is known to cause significant weakening of Hibiscus and Pittosporum. Damage is sometimes severe enough to kill the plants.

The scale occurs on stems and leaves. It looks like a somewhat flattened cone. It is white to gray. If you flip it over the female will get up and move.

There is potential for biological control of this species if it can be established that it is a serious pest. However, we need information on its current distribution and the species affected. Members are requested to keep their eyes open for this pest on native species in the field. If you suspect that you have seem it please make a collection and send specimens with location and plant species information to one of the State Entomologists.

AMANITA VIROSA IN HAWAI'I

George J. Wong
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
Honolulu, HI 96822

Where mushrooms are found in abundance, more people each year are discovering the delight of collecting and preparing edible mushrooms. Unfortunately, while eating wild mushrooms has become more popular, fatalities resulting from eating poisonous mushrooms have also become common place. One might assume from the number of deaths resulting from mushroom poisoning that large number of species are fatally poisonous. However, this is not true. Many are poisonous, but most, even if consumed in large quantities, will only cause nausea, diarrhea, or mild hallucination (Miller, 1972). Only a small number of mushrooms are fatally poisonous. Species of the latter usually belong to the genus Amanita Pers., and A. phalloides Fr. [The Death Cap] alone, is responsible for most deaths resulting from mushroom poisonings (Litten, 1975). Thus, it is fortunate that relatively few mushrooms occur in Hawai'i where mushroom poisoning is a rare event. The author is only consulted a few times each year in mushroom poisoning cases. Most of these cases have involved Chlorophyllum molybdites Mass., a species of mushroom that is not fatally poisonous, but is known to cause nausea, vomiting, cramps and diarrhea. However, it has recently been determined that one of the most common mushrooms on O'ahu is Amanita virosa (Fr.)Quel. [The Destroying Angel]. This species is closely related to A. phalloides and is equally as deadly. While ingestion of A. virosa has not been reported in Hawai'i, the author feels that a record of its distribution and how it may be identified would be noteworthy.

Most commonly, the author has observed Amanita virosa growing in soil, associated with species of Eucalyptus L'Hér., with which it probably forms a mycorrhiza. However, Doyle (1985) has also observed A. virosa to be associated with Casuarina Adans. and Melaleuca L.

A characteristic that will readily identify all Amanita species is the universal veil, a tissue that entirely covers the mushroom early in its development. At this stage it resembles a puffball. However, if what seems to be a puffball is cut longitudinally, a developing mushroom can be observed within the universal veil. As the mushroom stalk elongates through the upper portion of this veil, the remnants will remain at the base of the stalk forming a cup-shaped, bulbous structure that is now referred to as the volva or "death cup". The volva is usually not visible above the soil surface. Thus, if a mushroom is suspect, be certain to collect the entire mushroom and not leave the basal portion of the stalk in the soil. Since only one species of Amanita is known to occur in Hawai'i, mushrooms having this characteristic should be referable to Amanita virosa.

LITERATURE CITED

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Miller, O.K. 1972. Mushrooms of North America. Dutton and Co., New York. 460 pp.

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FUTURE MEETINGS

Fourth International Congress of Systematic and Evolutionary Biology.
ICSEB IV

ICSEB IV will be held at the University of Maryland, July 1-7, 1990. The theme for the conference will be "The Unity of Evolutionary Biology." The congressional symposia will focus on three major ideas:

- Evolution in perspective: biodiversity, conservation, biotechnology and global change.
- Tempo and pattern of evolution: micro- and macroevolutionary processes.
- Systematics and phylogenetic reconstruction.

The goal of the conference is to foster a resynthesis of the theory of evolution, incorporating new and traditional approaches. Keynote speakers will include: Douglas Futuyma, Stephen J. Gould, Richard Leakey, Robert May, Peter Raven, John Maynard Smith, Geerat Vermeij, Edward O. Wilson.

For further information write to: Congress Secretary, ICSEB-IV, Department of Microbiology, University of Maryland, College Park, Maryland 20742.

NEW RUST FUNGI ON ENDEMIC ZANTHOXYLUM AND PELEA

Ken L. Marr and Donald E. Gardner
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
Honolulu, Hawaii 96822

Leaf and pericarp samples from three of the four endemic Hawaiian species of Zanthoxylum L. (Rutaceae) were collected to test their extracts for insecticidal activity. During this study, it was noted that the leaves of three trees of Z. dipetalum H. Mann were host to a foliar rust. The infected trees are all on the island of Kaua'i in the Kōke'e area. The rust was initially found on approximately 70-80% of the leaves of a single tree (KM12) growing on the north facing slope of a gulch just north of Kakio Keokeo picnic ground, elevation 3,100 ft. (944 m). One other tree is reported to occur in this area (Tim Flynn, pers. comm.) but was not located in this study. Leaves previously collected from this second tree by another collector do not have the rust, however. At a second location along the Honopū trail at 3,500 ft. (1,066 m) two (KM39, KM43) of seven Z. dipetalum trees were found to have leaves infected with the rust.

Zanthoxylum dipetalum is also found on the islands of Hawai'i, O'ahu, and Moloka'i. This species is thought by Thomas Hartley to have descended from an Asian ancestor, whereas the other species of Zanthoxylum in Hawai'i are thought to have come from the South Pacific (Wagner et al., 1988). Leaf samples were collected from O'ahu and Hawai'i, but not Moloka'i. The rust was not found on any of four mature trees, nor eight saplings growing in Kipuka Puaulu, Hawai'i Volcanoes National Park (Hawai'i), the only location where leaves were collected on Hawai'i. However, Z. dipetalum var. tomentosum Rock is also reported to occur on "the lava flows of Mt. Hualalai, at Pu'uwa'awa'a" (Rock, 1913). Four trees from Oahu, all on Pu'u Kaua in the Waianae Mountains, were sampled. The rust was not found on any of these trees nor on leaves Z. hawaiiense Hillebr. or Z. kauaense A. Gray. Thirty-five individuals of Z. hawaiiense were observed in the Pōhakuloa training area on Hawai'i, and 78 individuals of Z. kauaense from 13 locations on Kaua'i, O'ahu, and Hawai'i were observed.

Aside from the collections of this study, the rust was found on a University of Hawai'i Botany Department herbarium specimen of Z. dipetalum collected by D. Herbst at Halemanu, Kaua'i, in 1968 (sheet no. 05496). No notation was made of the rust, however.

The rust is noteworthy in that it is probably a newly recognized, endemic species, known thus far only on Z. dipetalum from Kaua'i, and is an addition to Hawai'i's endemic rust flora consisting currently of only nine species (Gardner, 1987). Furthermore, no rust has been previously reported on a member of the Rutaceae in Hawai'i. The new rust appears to be microcyclic (consisting of only the telial spore state), and forms somewhat conspicuous clusters of dark pustules on both leaf surfaces.

A second Rutaceous rust, although undescribed, was collected on Pelea sp. in Mākaha Valley, O'ahu, in 1951. A meager specimen was deposited in the National Fungus Collections (Beltsville, Maryland) as "Xenostele sp." (sheet no. 123660). This specimen was examined by DG and found to be distinct morphologically from the new Zanthoxylum rust although it is also probably microcyclic. It is unlikely that the Pelea rust actually belongs to the genus Xenostele, which may be considered synonymous with Puccinia (Cummins, 1949). The five species originally placed in Xenostele are all limited to hosts of the Lauraceae. Additional collections of this fungus, which appears as a corky leaf gall about 4 mm in diameter, would aid greatly in confirmation of this single record, and establish its occurrence on one or more Pelea hosts in Hawai'i.

LITERATURE CITED

Cummins, G. B. 1949. New species of Puccinia on Lauraceae from China. Bulletin, Torrey Botanic Club 76:31-38.

Gardner, D. E. 1987. Hawaii's endemic rust fungi. Newsletter, Hawaiian Botanical Society 26:53-56.

Rock, J. F. 1974. The Indigenous Trees of the Hawaiian Islands. Charles E. Tuttle Co., Tokyo. 548 pp.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1988 (manuscript). Manual of the Flowering Plants of Hawai'i. Bernice P. Bishop Museum Special Publication. Bishop Museum Press. In press.

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CONTROL OF COCCINIA GRANDIS

Coccinia grandis can be successfully control using a 4% solution (vol./vol.) of either Garlon 4E or the ester of 2,4-D in diesel. The solution should be painted about 4 inches up the base of the stem. Diesel oil alone is not sufficient because resprouting will occur. A foliar application is being developed.

Dr. Philip Motooka, University of Hawaii Cooperative Extension Service, P.O. Box 208, Kealakekua HI 96740.

NOTES ON WEEDS IN HAWAI'I

Bignoniaceae

Linda Cuddihy notes that a sterile tree of Spathodea campanulata has been seen at 2,800 ft. elevation in a Kipuka east of Kane Nui O Hano in Hawaii Volcanoes National Park. This appears to be the highest elevation yet reported for this species.

Myrtaceae

Winona Char reports that she found allspice (Pimenta dioica) naturalized in Nu'uanu Valley on the slopes to the east of Hawaii Baptist Academy and along Nu'uanu Stream in the same area on 29 January 1989.

Melastomataceae

Linda Cuddihy comments further on the distribution of Tibouchina herbacea. It is present in Hawaii Volcanoes National park in two localities:

1) Numerous scattered plants 1.5-2m tall in the Lae'apuki ahupua'a above Hōlei Pali at approximately 2,000 ft. (667 m) elevation; and,
2) Only 2 plants less than 1 m tall in a Kipuka near the Park/Kahaule'a boundary, west of Pu'u 'O'o at 2,500 ft. (833 m).

None of the above plants were flowering or fruiting this fall. However, flowering plants were seen at the beginning of December along roadsides in the Fern Forest subdivision adjacent to Kahaule'a Natural Area Reserve. Steve Perlman told Linda that he had seen the plant within the Reserve.

This species was listed from West Maui in the last report. A recent survey of the natural area reserves on West Maui, headed by Mike Buck, State Division of Forestry and Wildlife, reports that this species is now widespread in the four reserves.

Cliff Smith notes that Oxysporum paniculatum is present along the trail in Mānoa Valley about 100 yards before the falls.

Sapindaceae

Cliff Smith reports that Cardiospermum grandiflorum is now well established on the Old Kalanianaole Highway below Olomana.

BIOLOGICAL CONTROL NEWS

Gorse

George Markin, Research Scientist, U.S. Forest Service reported that the moth Agonopterix ulicetiella (Stainton) was released at 6,400 ft. on the Saddle Road, Hawaii, on 29 November 1988. The larvae feed on the new shoots. Several other experimental releases have taken place and the results so far are quite promising. A release program began on Maui earlier this year at the Olinda Prison site. The moths laid eggs. Larval development was slow initially but a good colony has now established itself. The question that now arises is do the adults overwinter appropriately? They have a requirement for a certain length of cool weather. Two new strains from Europe will be introduced to quarantine later this year.

Two other insects are undergoing review for potential release. This international cooperative program (United Kingdom, New Zealand, U.S.A.-Hawaii and Oregon) appears to be working very well. Bob Burkhart will be going to Europe for further exploratory work next month.

George also noted excellent germination of 3-month old koa seedlings planted into patches of gorse that had been cut back. Growth of the seedlings was much better within the destroyed gorse patches than adjacent areas. Some seedlings had grown 10 feet in 3 years. Experimentation continues. This reforestation associated with control efforts is highly commendable.

Banana poka

The release of Cyanotricha necryia on the Big Island has not been as successful as one might hope. Ten thousand of these insects were released last year at Laupahoehoe but none have been recovered so far. There is no evidence of predation or parasitism. These moths complete their life cycle under laboratory conditions but the larval stages have not been observed in the field. The project leader intends to release the moth in the Ola'a Tract of Hawaii Volcanoes National Park (an environmental assessment was prepared). If all goes well, he plans a release at Koke'e, Kaua'i, later this year.

Koa haole

The State Department of Agriculture introduced an encyrtid wasp, Psyllaephagus spp. near rotundiformis to control Heteropsylla cubana, the psyllid that has been so effective in controlling koa haole. The control agent is well established and widespread but it is having little apparent effect on the psyllid.

Clidemia

The fungus released by Dr. Trujillo against clidemia is a good mycoherbicide. Unfortunately, it does not kill the plants but it does cause almost complete leaf drop. Perhaps recurrent infection by the fungus will have a dampening effect on the productivity of this weed. Another problem is that the fungus does not spread very much.

The buprestid release that was announced recently was partially successful. (The adult insects eat the leaves and the juveniles mine the leaves.) Adults have been recovered two months after release. However, the original release was too small and in a non-optimal situation so that chances of establishment are not good. A new release is required. Unfortunately, the original culture stock is exhausted and new stock is needed from Trinidad or Central America.

The release of Antiblemma announced recently did not take place. The species cannot be cultured in Hawai'i. No funds are available to introduce specimens from Trinidad into quarantine in Hawaii.

No new funds were requested for clidemia research or biological control this year due to a misunderstanding between the Departments of Agriculture and Land and Natural Resources. Therefore, the very promising biological control research that was being conducted by DOA has come to a standstill. Society members should consider alerting their representatives of the necessity of correcting this problem next year.

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RECENT DEATHS

The Society regretfully records the deaths of two long-time members, Oscar M. Kirsch, one of Hawaii's leading orchid growers who died in his 90th year on March 3, and Dr. Robert M. Warner, professor emeritus in Horticulture, who died at age 80. Dr. Warner for many years was in charge of the Waimanalo facility of the Department of Horticulture where many species of cultivated plants, and potentially useful plants are grown.

Old-time members will remember the orchids and fruits that these two members used to bring to meetings, and to the plant sales formerly sponsored by the Society.

LEGISLATIVE NEWS

At an information meeting on Tuesday 10 January 1989, a group of scientists, land managers and federal officials met with legislators from the Big Island to discuss possible legislation to speed up research on the control Myrica faya. Three approaches were recommended: biological control, cultural and herbicide techniques. A budget of $70,000 for each of two years was proposed.

Bills (SB409 and HB276) were later introduced to the State Legislature to fund the proposed program. Both bills passed out of the respective Agriculture Committees. A hearing was held before the House Finance Committee which passed the bill out of committee. The Senate Bill was introduced by the Chairman of the Way and Means Committee so there is considerable hope that this bill will survive. It is expected that it will be incorporated into the joint appropriation bill. The prospects for funding look good this year.

Another thrust in weed control was to encourage biological control research against waiwi (Psidium cattleianum) and miconia (Miconia calvescens). The enabling bill (HB 1652) was reported out of the committee dealing with environmental protection chaired by Mark Andrews. It has not been heard by the House Finance Committee. The Legislature is apparently shy of starting several thrusts to control forest pests at this time.

Several bills were introduced relating to the control of banana poka (Passiflora mollissima) on Maui. Their fate has yet to be determined.

A very important bill (HB 1004 and SB 1004) was introduced to ensure adequate financing of the Natural Area Reserve System. The bill proposed to set aside $4,000,000 each year from the hotel room tax. Several other bills were also introduced to earmark money from this revenue source including one to use $25 each year to upgrade the state park system. The bills passed out of the initial committees successfully. Their fate in the finance committees is not known.

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NEW BOOK

Marnie Hagmann. 1988. Hawaii Parklands: An interpretive companion to Hawaii's national, state, county, and private parks. Hawaii Geographic Series 1. Falcon Press, Helena & Billings, Montana. $16.95 + $2.00 shipping and handling. Local outlet: Hawaii Geographic Maps and Books, P.O. Box 1698, Honolulu HI 96806-1698. Telephone (808) 538-3952.

MAE E. MULL
(1921-1988)

Ruth Gay
Department of Botany
University of Hawaii at Manoa

Mae E. Mull, member of the Hawaiian Botanical Society for over two decades and leader in Hawaiian environmental issues, died on December 8, 1988. She is survived by her husband Bill of Volcano and her daughter Linda of San Francisco.

From 1965 until 1974 Mae lived on Oahu with her family, and attended Hawaiian Botanical Society Meetings where she consistently shared her thorough and thoughtful study of conservation issues.

Over the years Mae's dedicated searches and analyses bridged numerous gaps among governmental policies, legislation, the courts and the protection of Hawaiian landscapes and native biota. With great courage, she communicated her findings even in the face of great obstacles. Few cared so deeply, demonstrated greater persistence, and made an impact upon so many.

Mae and Bill moved to Volcano in 1974 where she has been described as the heart and mind of the Big Island environmental movement for fifteen years. Among Mae's many legacies are her contributions to the heightened awareness of the parts, interrelationships, and whole of the Hawaiian environments and their values for humankind.

Mae will be missed by those of us who knew her. Member Charlie Lamoureux wrote, "She will be missed most of all by all those Hawaiian animals, vegetables and minerals who never had a better friend than Mae."

Her memorial service was held at Bird Park and attended by family, friends, neighbors, resource managers, scientists, politicians, journalists, and entertainers. As demonstrated in the mixing of the guests, Mae's light continues to shine with the spirits that live on the lands and in the life of Hawaii.

BOOK REVIEW

Charles P. and Danielle B. Stone (eds.) 1989. Conservation Biology in Hawaii. University of Hawaii Cooperative National Park Resources Studies Unit. Honolulu. xiii + 252p. $16 (paper).

The biology of Hawai'i's natural ecosystems has long fascinated scientists interested in the insular examples along the age gradient demonstrated on these volcanic islands. This setting also provides special challenges to resource managers, such as how to protect rare an endangered species and how to control alien invasions.

This book not only demonstrates the improved communication between academic scientists and resource managers, but also extends far beyond these boundaries to address such issues as land use planning, tourism, classroom teaching, media, and ethics. In covering such a wide scope of topics, the editors can be commended for their pioneer effort to bring unity of understanding of the natural Hawaiian landscapes to many segments of our society. At the same time, inherent to that broadness of purpose is a degree of disjointedness that comes from bringing under one cover a diversity of writing objectives and styles from many fields of expertise. Disjunctions are reduced as the editors selected 32 contributors from a healthy cross-section of Federal, State, and Private Agencies and Institutions, and included many active workers and well-known names.

The book is divided into 7 sections. The first 5 sections offer generally well-integrated, current reports on research and management and include clear recommendations for future action. the last 2 sections seem to stand apart: the conservation call for comprehensive action; and the ethics section appearing as a few individual essays on the cultural values of natural resources in America and Hawaii. Indeed, either of these last sections could be expanded into separate books. However, they are used here to build bridges of communication from research and management to other fields of endeavor.

The editors are aiming to a reading audience of "educators, legislators, developers, parents, students, and other concerned groups and individuals." The book may be particularly useful for student use under the guidance and expanded coverage by a teacher. The easy-to-use glossary will be most helpful to students. Teachers-in-training will benefit from this book as a resource in their studies of education and as a reference to biological topics. Use of this book in conjunction with field experiences for education majors could make strong inroads toward reducing the science "phobia" that sometimes exists among practicing elementary teachers, even today. This book also may be an important resource for curriculum developers and instructors, as a current aid for developing unifying concepts and terminology from preschool through college.

Given the wide scope of coverage and numerous essays, readers will use the well-detailed table of contents heavily. An index would have been most helpful. Also, numbering of sections and chapters would have been helpful, especially for potential classroom use. I would have liked to have seen each author's affiliation listed with the essay as well as in the preface. The cross-referencing between essays is an unexpected aid to integration and is well done. Throughout the book, the lists of references and resources are plentiful and pertinent without being overbearing. One omission in the glossary and elsewhere seems to be the explanation of "conservation biology", an excellent title which seems to be used interchangeably with conservation education in the text. I found no typographical errors of significance. The sketches are lovely; worthy of captions in my opinion. Overall, the editing, layout, and quality of the book are good, reflecting many hours of effort expended by the editors and their assistants.

Many of the contributors, with whom I am familiar, took special efforts to write in a style appealing to a readership of concerned individuals from varied backgrounds. These efforts, in reaching out to a wide audience, are the strengths of this book. One can come away with an appreciation of the many resources and problems, and an overview of what workers are doing. The book will widen communication pertaining to an important aspect of Hawaii. In doing so, it will become a worthy tribute to the late Wayne Gagné, a loyal mover in biology, conservation, and education, to whom the book is dedicated.

Conservation Biology in Hawaii is a superb value at $16. It is available from the University of Hawaii Press if not at your favorite bookstore.

Ruth Gay
Department of Botany
University of Hawaii at Manoa

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HOSPITALIZATION

John Obata, a long-time member of the Society, recently underwent by-pass surgery. We all wish him a speedy recovery.

HAWAI'I STREAM ASSESSMENT

In 1987, the Hawaii State Legislature approved the establishment of a statewide water code to address the supply and conservation of Hawaii's water resources. It called for the establishment of a Commission on Water Resources Management to implement and administer the code. The Commission was charged with planning and coordinating "programs for the development, conservation, protection, control and regulation of water resources based upon the best available information" (Hawaii Revised Statutes, Chapter 174 C). A 1988 ammendment to the water plan further required the commission to "identify rivers or streams, or a portion of a river or stream, which appropriately may be placed within a wild and scenic river system, to be preserved and protected as part of the public trust" (Hawaii Revised Statutes, Chapter 174 C) .

Commission on Water Resources Management initiated the Hawaii Stream Assessment, a two year project to inventory and assess Hawaii's stream resources. The Commission expects the information gathered to help them make water protection and management decisions. Project direction is provided by a Steering Committee chaired by Mr. Manabu Tagomori, Deputy Director of the Department of Land and Natural Resources. Carol Wilcox will serve as Project Coordinator for the DLNR.

The Stream Assessment is being done in cooperation with the National Park Service which is providing the majority of the funding and the methodology through its State and Local Rivers Conservation Assistance Program. This Program was established in response to the Wild and Scenic Rivers Act which called for preparation and maintenance of a continuing inventory and evaluation of the outdoor recreation needs and resources of the United States and the identification of potential wild, scenic, and recreational river areas within the nation (Public Laws 88-29, 90-542). The National Park Service has designated Dr. Clifford Smith, Director of the Cooperative National Park Resources Study Unit, at University of Hawaii,, Principal Investigator of the Project. Sallie Edmunds will be the Project Coordinator for CPSU.

Wilcox and Edmunds will be gathering information about the physical, cultural, recreational, aquatic, agricultural, and riparian resource values associated with Hawaii's perennial streams with the assistance of seven working committees.

The study will result in a comprehensive computerized relational database of river resources and a written report documenting the Stream Assessment.

The information generated by the Hawaii Stream Assessment may prove useful to public and private sector planners and decision makers in addition to the Commission. Applications for other government agencies could include a comprehensive hydroelectric plan or a recreational development plan, for example. Developers could use the information as a guide to flag potential siting problems. Scientists will be able to do broad-based analyses as well as identify areas where further research is needed. Finally, the general public may find the Stream Assessment a good source of general information about Hawaii's streams.

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HAWAIIAN BOTANICAL SOCIETY
Minutes of the December 1988 Meeting

The meeting was called to order at 7:30 p.m. The minutes of the November meeting were read and approved. There was no Treasurer's report.

President Wester offered a few words on the passing of Charles Lum and Horace Clay, both of whom were Horticulturists in Hawaii for many years.

The Membership Committee proposed, and the Society elected, Manuel Balcita as a member.

Under old business, the slate of Officers for 1989 was read and nominations from the floor were asked for, no nominations were made and they were closed. The proposed slate of Officers was elected by acclamation. Officers for 1989 will be:

President	Dr. Mark Merlin
Vice President	Marie Bruegmann
Secretary	Patti Welton
Treasurer	Derrall Herbst
Directors	Dr. Lyndon Wester Dr. Isabella Abbott

Also under old business, the *Marsilea* Committee gave a report on the current condition of the population. The erection of barriers and removal of invading grasses has been successful and the plants are healthy and thriving. Volunteers were asked for to help weed on the first and third Saturday of each month until May to keep the plants from being encroached upon again.

Plant of the Month speaker was Steve Montgomery who spoke about the work done and the plants found in Tahiti during last summer's Marquesas expedition.

Speaker of the Month was Dr. Lyndon Wester whose topic was

"Mangroves and Mankind." Mangroves are now being seen as useful rather than undesirable elements of a coastal habitat. Some of their uses are wood, charcoal, medicine and shore erosion protection.

The meeting was adjourned at 9:00 p.m. and refreshments were served.

Respectfully submitted,
Maria Leu

HAWAIIAN BOTANICAL SOCIETY
Minutes of the January Meeting

The meeting was called to order at 7:30 p.m. The minutes of the December meeting were read and approved. The treasurer reported there is a balance of $3,570.

President Merlin offered condolences for the families of Horace Clay, a Horticulturist, and Mae Mull and Wayne Gagné, active conservationists in Hawai'i.

President Merlin reminded the members that dues are due, and that we should all make an effort to increase membership.

Volunteers were solicited for chairing the conservation committee and the refreshment committee. Anyone interested should speak to President Merlin.

Under old business, Dr. Lyndon Wester reported on progress of the _Marsilea_ work. The population is looking very well, but as always weeds are encroaching rapidly. Volunteers were asked to help weed on the first and third Saturday of each month until May.

Under new business, President Merlin announced that the Science Fair organization has again asked for awards contributions. In addition they have asked for donations to the operating costs of the fair. President Merlin asked for comments from the floor. It was decided that the officers committee would decide which donation to make this year.

Also under new business, Dr. Abbott announced that there was a meeting at the State Capitol on January 10 to discuss legislation to fund a biological control research program on _Myrica faya_, the fire tree. She suggested anyone interested should attend to show our interest in this problem plant. A show of numbers would help, even if those attending did not wish to speak during the meeting.

Plant of the Month speaker was Dr. Mark Merlin who spoke about the South Cook Islands and a new, as yet undescribed, species of

palm found there.
Speaker of the Month was Dr. Sam Gon III whose topic was "Biological Surveys of the Natural Area Reserves of Hawaii." The Hawaii Heritage Program of The Nature Conservancy is currently surveying 17 of the 18 NARs for the state. They include coastal lava flows and anchialine pools at 'Āhihi-Kīna'u NAR to rainforests and bogs on the slopes of West Maui NAR to alpine desert at Mauna Kea Ice Age NAR, and much more. Many interesting and rare plants have been found during these surveys, as well as the scenic and diverse natural communities that make Hawai'i unique.

The meeting was adjourned at 9:00 p.m. and refreshments were served.

Respectfully submitted,
Marie M. Bruegmann,
Substituting for
Patti Welton

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MOONWALKS 1989

Waimea Falls Park welcomed more than 10,000 participants on their popular full moon walks in 1988. You too can discover the beauty of an ancient Hawaiian valley at night. Take part in the fun this year when a park guide leads a one-hour stroll to the waterfall and back by the light of the full moon. Moonwalks depart from the parks' Visitor's Center at 8:30 p.m. sharp twice a month. Admission is free. Moonwalks are scheduled for the following dates in 1989:

April 19 & 20
May 19 & 20
June 17 & 18

October 13 & 14
November 11 & 12
December 11 & 12

Call Waimea Falls Park at 638-8511 for more information

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
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Newsletter
Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1988

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Vice-President: Marie Bruegmann, The Nature Conservancy Hawaii.

Treasurer: Derral Herbst, U.S. Fish and Wildlife Service

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Ken Nagata, Lyon Arboretum
Evangeline Funk, University of Hawaii
John Obata, B. P. Bishop Museum
Art Medeiros, Haleakala National Park

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MEMBERSHIP

The Society year is from December 1 through November 30 of each year.

Regular Membership is $7.50 per year.
Student Membership $4.00.
Family Membership $10.00; and,
Life Membership (individuals only) $150.00.

Life and Honorary Members pay no further dues.

STATUS, PROBLEMS, AND PROSPECTS OF THE HAWAIIAN TARO COLLECTION AT KAPAPA LO'I 'O KĀNEWAI

Ron Fenstemacher
c/o Ho'okahe Wai, Ho'oulu 'Āina
Box 61494, Honolulu 96839

The present status (3/89) of the many taro cultivars grown at Kapapa Lo'i 'o Kānewai (KLOK), the Hawaiian garden on Dole Street maintained by the Hawaiian Studies Institute and the Ethnic Studies Program is given. This area, Kānewai, is so named because from mythology it is one of places that the god Kāne used his 'ō'ō or digging stick to find fresh water for the Hawaiians, and may have been a large underground pool in the area whose waters were supposed to heal things (Williams 1935). The garden, however, diverts water from Mānoa stream with a dam. This water flows into an historic 'auwai or ditch, passes under the Dole street bridge, winds through the lo'i kalo or taro patches, and is ultimately returned to the stream. Mānoa stream joins with Pālolo stream and together they finally discharge into the Ala Wai Canal.

These lo'i were restored by Hawaiian studies students in 1980 and continue to be cared for by students from both the Institute and the Ethnic Studies Program. KLOK has acquired most of the taro cultivars from the Ke'anae Arboretum at Ke'anae, Maui, the Kaua'i Experimental Station at Wailua, Kaua'i, and from the Lyon Arboretum, University of Hawai'i, Mānoa. All three of these places share the same basic collection of cultivars which can be traced to those collected and studied for the classic work on Hawaiian taro: Taro Varieties in Hawai'i (Whitney et al. 1939). These authors, from about 140 field collected types, attempted to describe taro cultivars and sought to find duplicates and synonyms, and thus systematize the Hawaiian taros. Around the same time, Handy (1940) compiled over 300 folk names for taro cultivars, knowing full well there weren't over 300 distinct taros. The Hawaiian planters from different areas had given Handy different names for identical cultivars. Likewise, Hawaiians from various places may offer identical names but then apply them to different cultivars. Part of the interest in keeping the Hawaiian garden at the University is for the accumulation of observations that would aid scholars, plant scientists as well as anthropologists, to evaluate the folk taxonomy practices of the Hawaiians.

Presently, KOLK has 69 different taro cultivars of which 60 are Hawaiian and 9 are introduced. They are:

Hawaiian:

1. 'Āweu
2. Mana 'Ulu
3. Mana 'Ula'ula
4. Mana Lauloa
5. Mana Ke'oke'o
6. Mana'Ele'ele
7. Mana 'Oko'a
8. Piko Lehua-'āpi'i
9. Piko 'Ula'ula
10. Piko Kea
11. Piko Uaua
12. Piko Uliuli
13. Piko 'Ele'ele
14. 'Elepaio
15. UahiaPele
16. Manapiko
17. Kāī Uliuli
18. Kāī 'Ala
19. Kāī Kea
20. 'Apuwai
21. 'Apu
22. Pi'iali'i
23. Moana
24. Pa'akai
25. Lauloa "Ele'ele-'ōma'o
26. Lauloa Palakea-'ele'ele
27. Lauloa Palakea-papamū
28. Lauloa Ke'oke'o
29. 'Ele'ele Mākoko
30. 'Ele'ele Naioea
31. Manini-'owali
32. Kūmū-'ele'ele
33. Nwao
34. 'Ula'ula Kūmū
35. 'Ula'ula Poni
36. 'Ula'ula Moano
37. 'O'opukai
38. Manini Uliuli
39. Manini Kea
40. Nihopu'u
41. Manini 'Ōpelu
42. 'Ohe
43. Lehua Maoli
44. Lehua Ke'oke'o
45. Lehua "Ele'ele
46. Lehua Pala'i'i
47. 'Apowale
48. Wehiwa
49. Papapueo
50. Kū'oho
51. Le'o
52. Māea
53. Haokea
54. Kalalau
55. Hāpu'u
56. La'aloa
57. Moi
58. Pololū
59. IpuoLono (Mitchell, pers. comm.)
60. Manauea (see note)

Introductions :

1. 'Eka'eka
2. 'Iliuaua
3. Bun-long
4. Manini Toretore
5. Fa'afa'usi
6. Manalewa
7. Purple Leaf Noumea
8. Eot Lepar
9. Makalau

The Hawaiian taro cultivars that are described in Whitney, et al. (1939) but are not presently grown at KLOK are :

1. Mana 'Ōpelu
2. Piko Uliuli
3. Lauloa 'ele'ele-'ula
4. Lauloa Palakea-'ula
5. Lauloa Pakakea-ke'oke'o
6. Pāpākolekoa'e
7. Hinupua'a
8. Lauloa Uliuli
9. Lihilihimōlina
10. 'Oene
11. Piko'ele

Hopefully, some of these missing cultivars may still be found for two reasons: 1) The Lauloa group is reported to mutate back and forth (Whitney and Kikuta 1937), and 2) Piko Ke'oke'o, Lauloa "Ele'ele-'ula, Mana 'Ōpelu, and Pāpākolekoa'e were at the Lyon Arboretum in 1970 (Anonymous 1970).

Some cultivars seem to have vanished since 1939: Hinupua'a, 'Oene, Piko'ele, Lauloa Uliuli, Lihilihimōlina. One hopes these exist in a private collection (Schattenberg-Raymond 1983) or perhaps they persist in the wild. Simply recollecting the lost cultivars will not be easy for three reasons" 1) When Whitney et al. (1939) was published, the focus was on winnowing the 140 or so cultivars that were field collected to eliminate synonyms and duplicates. This was done as a field exercise; morphology was the yardstick. Where the taros were collected, from whom, and so forth weren't particularly germane to this field exercise. Apparently this information is now lost (Bowers 1988)., 2) Handy in his field work here did seem to put a premium on this type of information. His style seems systematic on just these points. In both volumes of his "Hawaiian Planter" (Handy 1940, and Handy and Handy 1972, p.84) is this tantalizing quote: "Less than a third of the complete records in my [taro] notes is presented. ... the many [taro] varieties described in my notes, but not included here, and verbal descriptions from old planters not checked with specimens are reserved for further study.". These notes may have been destroyed (Ashford 1988) or they may be in the possession of Donald Marshall of Berkeley, California. He received some of Handy's papers when Handy passed away. Being an anthropologist, his major interests are not plants. He hasn't yet completed a general inventory of these papers left to him (Marshall pers. comm.), so there is a slim chance that these notes still exist, 3) The last reason why recollecting these cultivars is difficult is simply that the number of people practicing the lifestyle that required intimate knowledge of numerous taro cultivars has dwindled considerably in the half century since the last collections of some of the taro cultivars was made. In 1989, how many of us now depend on homegrown taro as a staple?

Probably the best chance of locating lost cultivars rests in a survey of private taro collections. **If readers know of any private taro collections please alert the author who can be reached at the address at the beginning of this paper.**

A final topic clouding a simple issue like which taros are growing at KLOK is that not always do the published descriptions and actual cultivar characteristics seem to match. This provides yet another reason why a survey of private taro collections is vital. By addressing this topic through a video catalog of taro cultivars some of these questions can be answered.

The author would like to acknowledge the Hawaiian Studies Institute and the Ethnic Studies Program for their generous support of KLOK, the Lyon Arboretum, Ke'anae Arboretum, and the Kaua'i Experiment Station for sharing unselfishly their taro cultivars, and Harry Mitchell of Ke'anae for his inspiration of KLOK.

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COPELANDIA AND OTHER PSYCHOACTIVE FUNGI IN HAWAI'I

John W. Allen and Mark D. Merlin
Department of General Science
University of Hawaii at Manoa
2450 Campus Rd.
HONOLULU HI 96822 U.S.A.

With the recent identification of a deadly agaric Amanita virosa (Fr.) Quel., by Dr. George Wong on Oahu (Wong 1989) and Dr. Don Hemmes on Hawaii Is. (1989, Pers. Comm.), some other fungi which might be psychologically harmful, if not physically dangerous, are noted. Hallucinogenic mushrooms belonging to Psilocybe, Panaeolus, and at least 10 other genera, have been investigated since rediscovery of an hallucinogenic mushroom cult in Mesoamerica during the early 1950's (Wasson 1957). It has been reported that many of these species are now employed by many segments of society as a drug source to be used for recreational purposes rather than as a food item (Ott 1978; Singer 1978; Weil 1980). Worldwide, there are more than 130 known species of fungi which contain psychoactive alkaloids of psilocybin, psilocin, and other indole related compounds known as tryptamines. Psilocybin and psilocin possess a chemical structure very similiar to serotonin, a brain neurotransmitter that exerts powerful psychic effects through central sympathetic excitation. Most notable is an alteration of the normal functioning of the brain known as cerebral mycetism which produces visual effects, auditory hallucinations (synesthesia), and euphoria. In humans these effects are similiar to those produced by mescaline and LSD (Pollock 1975; Singer 1978; Hofmann 1980). In the Hawaiian Islands a number of these psychoactive mushroom species occur naturally, including five which have been identified. The three most common of the identified species of psychoactive fungi in the Hawaiian Islands known to contain psilocybin and/or psilocin are Copelandia cyanescens (Berk. & Br.) Singer, C. tropicalis Ola'h, and Panaeolus subbalteatus (Berk. & Br.) Sacc. All three of these melanosporous species belong to the family Coprinaceae and are primarily coprophilic, but have been known to occur in grassland areas where manure had previously been deposited. Under the provisions of Public Law 91.513, psilocybin and psilocin are registered as controlled substances (#7437 and #7438) subject to a fine and/or imprisonment. While these substances are classified as chemicals, there are no existing laws pertaining to the possession of mushrooms per se. Copelandia cyanescens, and C. tropicalis are known in Hawai'i by recreational users as "magic mushrooms," "gold caps," "blue meanies," "dimple tops," and "cone heads". They are the most common species employed for recreational, albeit illicit, purposes. Such illegal use has taken place rather commonly in Hawai'i for 20 years or more (Anon. 1972; Pollock 1974; Anon. 1981b;). Copelandia cyanescens, which seems to be of Asian origin, may have been introduced into the Hawaiian Islands with cattle which were imported from the Philippines during the early 1800's. The same mode of dispersal may also explain the presence in Hawai'i of C. tropicalis which was originally reported from Cambodia. Panaeolus subbalteatus, which has a worldwide distribution, and is often referred to as "red caps" in North America, is not commonly found on O'ahu, but is abundant in some areas of Maui. Generally, P. subbalteatus is less frequently collected for psychoactive consumption in Hawai'i. This latter species is known as the "weed Panaeolus", and accidental intoxication from this species has been reported in scientific literature for centuries (Pollock 1976). In Hawai'i, the three species of hallucinogenic mushrooms referred to above are reportedly popular with members of the youth counterculture, some college students, and some in the armed forces. While possession of many of these psychoactive species is illegal in the United States, very few prosecutions result from their use. However, in Hawai'i, people violating private property rights in search of such fungi are sometimes arrested for trespassing. Those who search for these psychoactive species often identify them by observing the intense bluing reaction which occurs through oxidation when the flesh of the mushroom has been damaged by handling. This confirms to some collectors that the gilled fungi are not deadly mushrooms. While some mycologists believe that the bluing reaction in C. cyanescens is variable and often absent, others often report its occurrence in this species as common and intense. In addition to the above mentioned Copelandia spp. and Panaeolus, two other common species in Hawai'i, have been listed as poisonous or hallucinogenic. They are Panaeolina foenisecii Maire, found in lawns and pastures, and Psilocybe coprophila Guzman, a dung inhabiting species. According to Guzman (Pers. Comm.), although these two species may be toxic, neither of them is psychoactive. Except for C. tropicalis which was originally identified by Ola'h (1968) as occurring in Hawai'i, voucher specimens of all of the above discussed species were sent to Dr. Gaston Guzman of the Instituto de Ecologia in Mexico city. Dr. Guzman, a recognized expert on psychoactive fungi, varified the identities of the specimens collected in Hawaii. Field collection specimens to be deposited in the Bishop Museum Herbarium is now in progress. Amanita muscaria, a powerful psychoactive mushroom with very dangerous relatives in the same genus (see Wong 1989), has been reported to Don Hemmes (1989, Pers. Comm.), UH Hilo biologist, as occurring in Hawaii, but no specimens have been verified as yet. Allen and Hemmis collected specimens of C. cyanescens and P. subbalteatus on Hawai'i Is. in December of 1988. It is also worth noting that spores belonging to so-called "Hawaiian" strains of Psilocybe cubensis have been offered for sale through advertisements in High Times Magazine, a counterculture publication. This psychoactive mushroom species, however, apparently does not occur in Hawai'i, except under clandestine conditions where it is cultivated in vitro. The number of people who seek medical attention for psychological problems associated with either accidental or deliberate ingestion of these psychoactive fungi has risen sharply in some areas of the world during the past 10 years (Southcott 1974; Harries & Evans 1981; Young et al 1982; Bennell & Watling 1983). However, during the last 15 years, only a few toxic reactions resulting from ingestion of Copelandia cyanescens have caused concern in the Hawaiian Islands. Pollock (1974) reported the death of a young man in Hawai'i, which was supposedly caused by the ingestion of this species. Allen (1988) investigated this report and found that no mushrooms were involved. In 1981, a 14-year old male received a gastric lavage at Castle Hospital after taking an overdose of this species (Anon. 1981a). A similar case was reported from the same hospital in 1988 (Pers. Comm. Staff at Castle Hospital). In 1981, a teen-ager in Kona, who had previously eaten psychoactive mushrooms on several occasions with un undesirable effects, consumed a small handful of mushrooms, lost control of his senses, and inflicted himself with multiple stab wounds; subsequently, he sought treatment at a Kona hospital (Stapleton 1981). While the fear of poisoning by toxic fungi is the main cause of mycophobia throughout the world, mycologists have recognized that some of the deadly species macroscopically resemble those fungi which might be picked for their suspected hallucinogenic properties. Although the possession of fungi containing illegal substances raises serious ethical concerns, the main medical dangers associated with psilocybian poisonings are primarily psychological in nature. Anxiety or panic states, depressive or paranoid (guilt) reactions, mood changes, disorientations and an inability to distinguish between reality and fantasy have been reported. Treatment for this kind of poisoning is generally supportive (the talk down method or a gastric lavage). Psychological distress resulting from consuption of hallucinogenic mushrooms may induce pararnoid reactions or illusions which might lead to dangerous behavior in some people, under certain conditions. Nevertheless, the inherent physical danger associated with the ingestion of wild mushrooms lies not so much in the consumption of an hallucinogenic species, but rather in the misidentification, collection and consumption of a physically poisonous species which might resemble a psilocybian species.

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NOTES ON WEEDS IN HAWAII - III

Aizoaceae

Winona Char reports that Trianthema portulacastrum appears to be spreading. It has now been found at Makapu'u adjacent to Sea Life Park on a pile of coral fill near the unpaved road.

Asclepiadaceae

George Linney reports that Cryptostegia madagascariensis is also naturalized in Kailua-Kona on Palani Road a little way above the mauka traffic light. Another group of plants is adjacent to Kamehameha III Road in Keauhou.

He also noted a range expansion of Calotropis procera south to old Kona airport out on the lava flow close to the Casuarnia trees and north to the Kawaihae area opposite the Hawaiian Telephone building close to the junction of Queen Ka'ahumanu Highway and Kawaihae Road.

Cucurbitaceae

Winona Char notes additional locations of Coccinia grandis on O'ahu. Three small plants were seen on a 20-acre parcel on the Waimānalo side of Sea Life Park at Makapu'u. A dense mat of plants was also observed climbing over koa-haole adjacent to Kahuku Sugar Mill.

Clifford W. Smith, Botany Department, University of Hawaii.

MAILE RUST HAS A NEW COUSIN IN AUSTRALIA

Donald E. Gardner
National Park Service Cooperative Park Studies Unit
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
Honolulu, Hawaii 96822

Maile (Alyxia olivaeformis Gaud.) rust was described in 1925 as Uromyces alyxiae Arth. in Stevens (Stevens, 1925) with the notation that the fungus was rare and found nowhere in more than very scant quantity in Hawaiian forests. The rust appears as raised, sporulating brown spots on the undersurfaces of leaves, each with a distinct, usually circular chlorotic spot on the corresponding upper surface. The tissue of the light-colored spot may be slightly sunken. Most freshly sporulating rust spots measure 0.5-5 mm in diameter and first appear on young leaves, becoming crusty or corky on older growth. Stem infection also occurs, causing a gall-like growth of spore-producing tissue. Stevens (1925) listed U. alyxiae among Hawai'i's few endemic rusts, and I likewise included this fungus as one of the nine currently known rust species endemic to Hawai'i (Gardner, 1987a).

Although maile rust cannot be described as abundant in most stands of maile that I have observed, it is, nevertheless, more common than Stevens thought it to be. The trained eye is sometimes able to observe rust infection on the maile leis worn at commemorative or festive occasions.

Maile rust had received little critical attention since Stevens' earlier observations until my recent unsuccessful attempts to demonstrate the life cycle through inoculation studies (Gardner, unpub.). Notwithstanding my failure to obtain infection, no evidence exists that the rust is other than a microcyclic species producing only the telial (including the basidial) state, in accordance with the original description. My studies did lead to interesting observations on the unusual method of teliospore germination and basidiospore production, however (Gardner, 1987b).

My publication came to the attention of Dr. John Tierney, a plant pathologist with the Department of Forestry, Queensland, Australia. Dr. Tierney previously had collected an undescribed microcyclic rust on Alyxia ruscifolia R. Br. in the Bunya Mountains near Brisbane, Australia. Comparison between the two rusts indicated obvious morphological and color similarities between teliospores such that the new rust may be considered a variety of U. alyxiae. Spores of the Australian material were slightly more robust, measuring (24-)26-32 x 16-21 um with a thickened apical wall 5-8 um thick. Spores of maile rust measured 23-29 x 12-17 um, with an apical wall thickening of 4-7 um. Both rusts had similar apical germ pores. The Australian material was not germinated in this study since it had been heat-treated and was not viable.

The new rust occurs on stems as well as leaves as does maile rust, however sporulating leaf spots of the Australian rust are not confined primarily to the lower leaf surface, but occur readily on both surfaces. With careful observation, leaf spots of maile rust are seen to consist of a number of minute coalescing telia on hypertrophied tissue resulting in the appearance of a single spot. Each telium has a ragged border of ruptured epidermal tissue. On the other hand, each leaf spot of the Australian rust consists of a single, larger telium (0.1-1.5mm diameter), sometimes bordered by a uniform rim of host epidermal tissue, giving a cup-like appearance.

The similarity of these rusts to one another, both of which occur on endemic Alyxia hosts and which are themselves probably endemic to widely separated regions, is noteworthy. Another Alyxia rust, Puccinia alyxiae Cke. & Mass., occurs in Australia on A. buxifolia R. Br. (McAlpine, 1906) and is probably closely related to both maile rust and the new Australian variety, although P. alyxiae does not occur in Hawai'i. These observations are particularly interesting in light of earlier studies of the affinities of Hawaiian rust fungi on Acacia koa Gray and A. koaia Hbd. to Australian Acacia rusts (Gardner and Hodges, 1985). They demonstrate the distribution of close host species and indicate a more intimate biological link between the two regions than mere geographic distances would suggest.

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BOOK REVIEW

George K. Linney

Indexed Bibliography on the Flowering Plants of Hawai'i by S.W. Mill, D.P. Gowing, D.R. Herbst, and W.L. Wagner. 1988. University of Hawaii Press, Honolulu. vi, 214 pages. $25.00.

This effort is an outgrowth of Manual of the flowering Plants of Hawai'i project of Bernice P. Bishop Museum. It is a listing of all publications from 1784-1986 dealing with native and naturalized flowering plants in Hawai'i. The book was not intended to be a complete listing of publications that deal only indirectly with native and naturalized species. The many privately published works of Otto and Isa Degener were also excluded, having been treated previously (Taxon 34: 229-259).

The **Bibliography** is divided into two parts: a 163-page listing of publications by first author; and subject, taxonomic, and place name indices. Lack of cross-listing or indexing of coauthors is a major shortcoming of the bibliography. This is not a "literature cited", in which the reader will always have the name of the first author as guide, and there may be occasions when only a coauthor is known.

An even greater weakness is found in the execution of the subject index. There are only 29 headings and no subheadings or annotations, only long lists of numbers corresponding to the bibliographic listing. There are over 300 listings under "autecology" and over 1100 under "taxonomy/systematics." If users do not know the first author of a paper and attempt to find a specific listing under one of these topics, they face and arduous search. The authors of the **Bibliography** suggest cross-checking between two categories, a simple task in a computerized database, a daunting challenge that becomes intolerable after the first or second manual search. If the authors really want the subject index to be used, they might have considered using subheadings to reduce the mass of citations that need to be sifted.

The taxonomic index, on the other hand, is eminently useful, although there are some quirks. A native species formerly considered a Drypetes or Neowawraea, but treated as a Fluggea in the forthcoming Manual, is listed under the first two names but not under the third, since that determination was published only after 1986. Future usefulness of the index will be limited as more users come to know the plants by post-1986 names. A cross listing of accepted post-1986 names would have extended usefulness.

The place name index will be of interest to those who are looking for a specific publication, but know only the locale of the collection or study. It should also be of use to those who wish to recompile localized species lists based on published records.

The **Bibliography** serves a much needed function in bringing together such a large body of published papers, despite its shortcomings, and should be a worthwhile addition to the library of any serious student of the Hawaiian flora. Unfortunately, its precise relationship to the forthcoming Manual is not known. If it is not significantly different from the references in that work, it may be worth waiting a year or so and investing in only the Manual. If one does not wish to invest as much as the Manual promises to cost, then the **Bibliography** is the appropriate choice.

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AN UPDATE ON COCCINEA (CUCURBITACEAE) IN HAWAI'I

George K. Linney
Department of Botany,
University of Hawaii at Manoa
3190 Maile Way,
HONOLULU HI 96822 U.S.A.

Since the original report of Coccinea grandis in Hawai'i, some additional populations have come to light. On the island of O'ahu very old and large populations have been found along Renton Road on the Ewa Plain and at Waialua-Haleiwa on the North Shore. Both of these are already too large to be easily eradicated and represent additional nuclei from which this very aggressive invader can spread in the future.

In addition, the range of this species on the Kona coast of the Big Island has recently been observed to have extended to the Kona acres and Kona Palisades subdivisions above Keahole Airport, a jump of at least six miles from its previously reported range. This is in an area with extensive native vegetation, including Dispyros sandwicensis, Sophora chrysophylla, Bidens micrantha ssp. ctenophylla, Reynoldsia sandwicensis, Lipochaeta venosa(?), and Caesalpinia kavaiensis. There is now imminent danger that Coccinea could spread to the dry forest of Ka'ūpūlehu and threaten many rare plants there by its smothering growth habit. A biological control agent must be found soon if the dry forest is to be protected.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the February 1989 Meeting

The meeting was called to order at 7:30 p.m. The minutes of the January meeting were not read. Derral Herbst read the Treasurer's report.

Under new business, Dr. Isabella Abbott announced that there would be a hearing on Thursday, February 9, at the State Capital about Myrica faya. The Senate and the House have provisionally approved a Bill allocating $80,000 to the Department of Agriculture for research on its control.

President Merlin informed the members that the Nature Conservancy of Hawaii is calling for proposals for innovative research projects concerning terrestrial conservation biology in Hawai'i. This is part of a small grants program under the Hawaii Conservation Biology Initiative. Deadline for proposals is April 20, 1989.

Dr. Abbott introduced the Plant of the Month Speaker, Dr. Ron Fenstemacher. He is a chemist and working at the Board of Water Supply. He entertained us with the history of Ava, (Piper methysticum), from the Hawaiian perspective. It is a highly variable plant which was prized by the Hawaiians, as they have about 20 different names for it. He cultivates Ava at Ka Papa Lo'i 'O Kānewai, on Dole St., which is a garden for Hawaiian plants and people. He helped begin this garden on Election Day 1980.

The Speaker of the Month was Dr. Vincent LeBot, currently a guest researcher in the Department of Horticulture. His topic was "Kava: The Potential of a Plant in Oceania: Awa (Piper methysticum). He worked with Kava in Vanuatu for 7 years, aiming to transform Kava from a traditional into a cash crop for purposes of economic development for the people. France uses natural extracts from this plant for pharmaceuticals. He described the ways farmers in Vanuatu select for varieties of Kava for superior qualities for drinking as well as for medicinal purposes. There are many cultivars as it has a highly variable morphology. He found that specific chemical extracts correlated with the different cultivars. He also worked on tracing the origin of Kava and believes it was first domesticated in Vanuatu as there is the greatest range of varieties there.

Both talks were amusing and many questions about drinking Kava were asked afterwards. Many people remarked that the topic drew the highest number of people in a long time.

The meeting was adjourned at 9:00 pm and refreshments served.

Respectfully submitted
Patti Welton, Secretary.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the March 1989 Meeting

The meeting was called to order at 7:30 pm. The minutes of both the January and February meetings were read and approved. Guests were introduced. Derral Herbst read the Treasurer's report.

President Mark Merlin informed those present of the passing of Juliette O. Wentworth, who served as secretary for the Botanical Society in 1947 and 1948. She had been a member of the Society for 48 years.

Dr. Lyndon Wester informed those present of a weeding party on March 18th for the Marsilea project at Koko Head. Those interested should contact him through the Department of Geography at UH. There is a weeding party every first and third Saturday of the month. He reported that they are trying a new management plan which is the use of a weed whacker which cuts off the top of the plants which shade the fern.

Under old business, President Merlin reiterated the Nature Conservancy's call for proposals. Those interested should contact Joan Canfield and Ken Kaneshiro. Dan Palmer reminded the members that there is available research funding through the Neal-Miller Fund of the Society. Those interested should contact a Board Member of the Society.

Vice-president Marie Bruegmann introduced the Plant of the Month Speaker, Sue-Hwei Chang. She is a Ph.D. student in the Department of Plant Molecular Physiology at UH. She spoke about Eucheuma alburhizii, a member of the red algae. Carrageenan is a mucilaginous substance present in the cell wall and intercellular spaces of this alga. It is used as a stabilizing or thickening agent in the food and cosmetic industries. Eucheuma is grown commercially in the Philippines. Sue-Hwei worked with the pigmentation of Euchuema alburhizii for her masters degree in the Department of Botany at UH.

The Speaker of the Month was Candace Lutzow, who is a graduate student preparing for ethnobotanical research for her Ph.D. in the Department of Botany at UH. The audience travelled vicariously to islands of the United States on the other side of the mainland, the United States Virgin Islands, in the Caribbean, where she lived while completing her field work for her masters degree in Botany at the University of Southern Illinois. Her topic for the evening was "The Ethnobotany of the French Caribbean People of St. Thomas", but she began her discussion with the colorful history of the island from the pirating days of Bluebeard to the last days of the Danish sugar plantations. She explained the arrival of French farmers from the nearby island of St. Bartholemy after the plantations were abandoned. They moved up to the lush hillsides while the slaves moved to the seaside and made a port city. She bespelled us with beautiful slides of her remembrances and charmed us with tales of plants used by the farmers and the seaside folk ranging from fish poisons to supposed aphrodisiacs. The scope of her presentation was captivating, and many in the audience felt homesick for St. Thomas when the presentation finished.

The meeting was adjourned at 9:00 pm, yet the ambiance of St. Thomas continued with Candace's refreshing homemade treats of coconut bread, rum cake, and ginger beer, and the accompanying calypso music.

Respectfully submitted
Patti Welton, Secretary.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the April 1989 Meeting

The meeting was called to order at 7:30 pm. The minutes of the March meeting were read and approved. There was no report from the Treasurer.

Dr. Lyndon Wester reported on the Marsilea project at Koko Head, O'ahu, which he considered a success.

Vice-president Marie Bruegmann introduced Patti Welton as the Plant of the Month Speaker. Patti is a M.S. candidate at UHM in the Department of Botany. She spoke about the two species of Citharexylum (Verbenaceae), commonly called fiddlewood, which are both present and naturalized on O'ahu. She showed slides and specimens to distinguish between the two. Seeds of Citharexylum caudatum were brought to O'ahu in 1929 by the wife of E.L. Caum. While in Panama she noticed birds voraciously feeding on their prolific orange fruits and believed they would provide food for the birds here. She planted them in the back of Mānoa Valley at the Hawaiian Sugar Planters Experiment Station which is now the Lyon Arboretum. Soon afterwards, fiddlewood became a nuisance and now is present on Tantalus and on the windward side around Kāne'ohe and Kailua. A few years ago, Ray Baker began noticing large thick stands dying around the Arboretum. Galleries of the black twig borer beetle, Xylosandrus compactus, were found in the dead twigs, along with the red-staining fungus, Fusarium solani. Whether this is the causal agent for the plant dieback has not been conclusively determined, as the beetle has over 100 other hosts on O'ahu. It is curious that the first stands to die are the oldest, and, that there has yet to be dieback in the windward populations. Citharexylum spinosum is used as an ornamental, and, is common along city streets and shopping centers. It has naturalized in Waimānalo where Forestry records list plantings of it in the 1930's.

The concern that these two species be listed as noxious weeds and therefore banned from further use as ornamentals was voiced. However, it is already too late for the species of fiddlewood. The State Department of Agriculture is in the process of developing a new list of noxious weeds for the Islands and also changing the rules concerning importation of seeds. They are also proposing that ornamental plants be included under the importation controls.

The subject of using native plant species as ornamentals was discussed, and the recognition of a native plant committee within the Botanical Society was acknowledged. Interests in native ornamentals is growing in the landscaping community, but has yet to be used widely. However, it was noted that the only nursery specializing in lnadscaping with native species went out of business on Maui this year.

President Mark Merlin introduced his long time friend and colleague, Dr. Jim Juvik, as Speaker of the Month. He is chair of the Department of Geography at the University of Hawaii at Hilo. His topic was a comparison of primary succession on different volcanic islands around the world. He showed slides of the different species of Metrosideros from New Zealand and Samoa. In New Zealand, the Metrosideros forms a broader canopy than that of the Hawaiian species. This canopy provides shade for a community of associated species. He also showed us slides from Reunion Island in the Indian Ocean where there is no Metrosideros, yet the species exhibit similar patterns of succession as in Hawai'i. His talk was very interesting and informative, and evoked considerable curiousity among the listeners.

The meeting was adjourned at 9:00 pm, and refreshments and discussions followed.

Respectfully submitted
Patti Welton, Secretary.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

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A PROPOSAL FOR A NATIVE PLANT LANDSCAPING AND REVEGETATION PROGRAM FOR HAWAII

Geary S. Mizuno
815 C Street, N.E.
Washington, DC 20002

ABSTRACT

A program for native plant landscaping and revegetation is described. The goals of the program are to foster and enhance public awareness of native Hawaiian species in landscaping, and the recovery of degraded native ecosystems. Individual projects would be carried out by community and school organizations. Central guidance and technical support would be provided by a central program office. This article is a condensation of a more detailed paper. Copies of the complete paper may be obtained by writing the author.

THE NEED FOR NATIVE PLANT REVEGETATION AND LANDSCAPING

The destruction of native Hawaiian ecosystems and the consequent extinction or near-extirpation of endemic and indigenous species has been well documented in the literature. Efforts to date by government (e.g. National Park Service, Hawaii Natural Areas Reserves Commission) and private organization (e.g. the Nature Conservancy of Hawaii) have focused on identifying, obtaining protection for, and managing remaining examples of native ecosystems. While these efforts are necessary, other alternative measures for preservation of native plant species have not been attempted. Private residences, schoolgrounds, parks, roadsides and highway waysides, as well as undeveloped beaches, mountainsides and stream gulches offer the potential for plantings using indigenous and/or endemic species. The author believes that a program for encouraging the use of native plants in landscaping and ecosystem revegetation is a desirable complement to efforts to preserve important endemic ecosystems.

There are two separate objectives that may be achieved by such a planting program. The first is public awareness and appreciation of native plants. Currently, most persons do not have day-to-day contact with a wide variety of native plants. There is public awareness of 'ōhi'a (Metrosideros), maile (Alyxia olivaeformis), koa (Acacia koa), and ahinahina (Argyroxiphium). However, there is much less public recognition of species such as alani (Pelea), kokia (Kokia drynarioides), and lama (Diospyros ferrea). It is not that native plants aren't attractive; indeed, many are quite handsome and would make beautiful additions to a landscape. Rather, public indifference can be traced to a lack of daily contact with native plants. Native species are not seen while walking or driving to work, going to the beach, or playing in parks. All too often, alien plants are used to give a "tropical" look to landscapes; hence the public's identification of alien species with Hawai'i. Even "wild" areas seen by residents and tourists, e.g. Nu'uanu and Kalihi Valleys alongside the Pali and Likelike highways, are predominantly alien ecosystems. The average person, not being familiar with native plants, has a difficult time understanding arguments about their beauty and intrinsic worth. The use of native plants in gardens, school grounds, parks, and along highways would help to awaken the public awareness of native plants.

The second objective for planting native species is to enhance the viability of native ecosystems. Plantings of native species can help increase populations of endangered and threatened plants, thereby preserving genetic diversity and reducing the severity of localized enviromental perturbations which may adversely affect the population of a given species.

Planting local native species in degraded areas adjacent to relatively pristine native ecosystems may also reduce the possibility that alien plants and insect will become established in the undisturbed ecosystems. In many degraded native ecosystems, the spread of alien species was due to disturbances by feral animals or human activity. However, in many cases the original source of disturbance is no longer operative, e.g. the land is no longer used for pasture, or feral animals have been removed, and conditions favorable to native species may well return. If native species are reintroduced and alien species reduced locally through mechanical, biological or chemical means, native species may displace (or reduce to tolerable levels) non-invasive alien species within that area. In addition, if the total population of an invasive alien species is reduced, a reduction in the vectors for expansion of that alien species into relatively undisturbed portions of the ecosystem may be achieved. This can be understood as the "displacement effect."

In addition, as alien species are eliminated from the border of the undisturbed ecosystem, the distance that needs to be traversed by an invading alien to colonize an area, either by vegetative reproduction or by seed, is increased. As distance increases, the time necessary to reach the borders of the undisturbed ecosystem increases. Greater distance increases the time necessary for the alien population to reach the undisturbed ecosystem. distance also decreases the likelihood of a alien species "leapfrogging" from a disturbed area into an undisturbed area. This relationship between distance and the dispersal of alien species can be termed the "proximity effect."

If the displacement and proximity effects are valid, then a program of reintroducing carefully-selected* native species to altered environments adjacent to relatively pristine areas can forestall the adverse effects of alien species. More optimistically, such planting coupled with an aggressive program to eliminate especially virulent and aggressive alien species can result in long-term recovery or partial restoration of the original native ecosystem for that area.

In sum, greater public awareness of native species, as well as the restoration of former native ecosystems, are two goals which can be facilitated by a program for encouraging landscaping and revegetation using native plant species.

OUTLINE AND FUNDING OF A NATIVE PLANT LANDSCAPING AND REVEGETAION PROGRAM

The proposed program may be characterized as "informed community voluntarism," for it relies on volunteer community participation and support to carry out individual landscaping and revegetation projects. Ideally, the Program would be administered by an existing government agency or a private, non-profit organization. Existing government agencies, such as the State Department of Natural Resources, Division of State Parks, or the City and County of Honolulu, Department of Parks and Recreation, currently have governmental respons-ibilities which are compatible with the goals of a native species planting program. In the non-profit sector organizations such as the Sierra Club, the Hawaiian Botanical Society and the Garden Club of Honolulu have interests which are consistent with the goals of a native species planting program. Administration of the program by a government agency or a non-profit organization would provide necessary continuity, institutional memory and resources.

A central coordinator would be responsible for directly administering the program. The coordinator would initiate direct contact with local organizations to inform them of the program and work with them to develop appropriate local planting and landscaping projects. The coordinator would also monitor ongoing projects, and act as a liaison to the relevant government agencies. Yearly reports summarizing the work and finances of the program would also be prepared by the coordinator. Finally, the coordinator would be responsible for fund-raising.

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*For a more detailed discussion of the criteria and considerations relevant to selection of appropriate native species for a planting program see below.

Volunteer propagation of plants to be used in planting projects would also be directed by the coordinator. At first, it is expected that individual volunteers would grow plants at home, either for subsequent distribution and planting or as a source for seeds. Later, if suitable space is made available by a private organization, business or government agency, plants could be grown at a few centralized areas, so that other volunteers would have easy access to the plants for weeding, fertilization, watering, pest control, and seed harvesting.

An advisory board or committee should be established to develop appropriate species planting lists, native plant propagation information, and other technical information. Information developed by these committees would be published for general dissemination to appropriate government officials and leaders, commercial nurseries, and the general public.

Actual landscaping and ecosystem restoration projects would be implemented and maintained by community organizations and school groups, such as the Boy Scouts, Jaycees, and the Sierra Club. Each organization would commit to conducting and maintaining one or more planting projects. Selection of the project would be made by the organization in conjunction with the Program's central coordinator. Once a project was selected the organization would designate a member to be a project coordinator, who would be responsible for directing a project. The project coordinator would recruit volunteer manpower and in-kind support, and develop fund-raising strategies, if necessary.

Costs for implementing this program are necessarily speculative. The greatest line-item cost is the salary for the central coordinator. As suggested above, an active State-wide Program will require a full-time central coordinator. A reasonable salary for the central coordinator would be $20,000 p.a. The program's success will depend on the enthusiasm and dedication, as well as the competence of the central coordinator. It is unreasonable to expect an acceptable individual to fill the position without fair and adequate compensation. For this reason, the author strongly suggests that the program be administered and funded by State and County governments. Given the current governmental climate, this is not going to happen during the first few years of the program. However, as public awareness of the Program increases, public pressure could be brought to bear in favor of governmental sponsorship.

In the meantime, the author urges that a purely voluntary system be initiated, to demonstrate the viability of the program. Under a voluntary system, the central coordinator's responsibilities would be the direct costs for plant propagation, field planting and maintenance, on-site work to protect the plants and identify the project (e.g., fencing, tagging and placement of signs), and publications. These costs could be met or avoided in a number of ways. Funding could be sought from national conservation and public interest foundations, such as the Ford Foundation. Local businesses could also be approached to fund specific projects, especially those landscaping projects that would directly benefit the property of such businesses*. For example, a restaurant could be induced to pay for landscaping of its parking lot and surrounding grounds using native plants such as _Hibiscadelphus_, _Morinda_, _Diospyros_, etc.

The next avenue of cost reduction is cost-avoidance through in-kind contributions. If the Program is administered under the auspices of a government agency or a private, non-profit organization, presumably it would provide the necessary space and incidental supplies (stationary, postage, etc.). Alternatively, the office could be located in a private residence.

A quarter-acre site would be required for plant propagation for each project. Several sites would be desirable, each located in areas with environmental conditions similar to the areas in which the plants would actually be planted. Propagation sites would require water and electricity service, fencing, growing stands, and a secure tool storage facility. Initially, if individuals, government entities, or private business could lease suitable land to the program for a _de minimus_ fee, program costs would be drastically reduced. In-kind contributions of land for plant propagation, horticultural materials (potting materials, fertilizers, fungicides and herbicides as necessary), and tools would also minimize the costs of the program.

Finally, the program should consider direct solicitation of money form the general public, perhaps through a sponsorship scheme where individuals "sponsor" the planting and maintenance of specific trees, shrubs, or a designated portion of a project.

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*A long-term project would be to develop a list of landscaping guidelines for landscape architects, and to develop a list of program-approved landscape architects, designers and nurserymen who specialize in the use of native Hawaiian plants.

CRITERIA FOR SELECTION AND PROPAGATION OF NATIVE PLANTS

The success of individual projects will depend to a great extent on the selection of appropriate native species for planting. For landscaping by the public, planting lists should be published for distribution to homeowners on landscaping with native Hawaiian species. These lists would be developed by botanists, ecologists, and horticulturists. Different lists could be produced for each island, with each list suggesting plants for different locations on the island (e.g., the leeward side of West Maui Mountains), or for major ecotypes (e.g., strand, dry forest, mesic forest). Plants should also be selected with the following horticultural criteria in mind:

a. Hardiness of species to environmental conditions, such as drought, salt or waterlogging.

b. Resistance to insect pests, bacterial and fungal infestations, and nematodes.

c. Showiness of plant, for landscaping projects.

d. Ease of propagation and growth, including resistance/susceptibility to disease and pests.

The plant lists could be printed on 8.5"x 11" stock, in a format such that the stock can be folded to create a brochure. Brochures would show a full-color picture of the plant, provide a brief description of landscaping characteristics, and provide information on propagation, fertilization, and pest and disease control. The brochures could be sold at a price to recover the costs of printing (approximately $1.00 each). Organizations such as the Outdoor Circle and the Friends of Foster Garden could underwrite the costs of production and initial printing, as well as publicize and distribute the brochures.

For specific planting projects, individualized planting lists should be tailored for the specific locality where the project is to be implemented. As with the general lists for the public, individual planting lists should be developed by knowledgeable botanists, ecologists and horticulturists. More importantly, plants which are known or are likely to have grown at the specific location of the project should be selected. Historical accounts of vegetation by early explorer/botanists such as Rock, Brigham, and Hillebrand should be consulted, as well as the notes and collections made by more contemporary botanists.

Some additional caveats must be observed in the development of planting lists. Lists should reflect the need to assure that gene pools for plants remain native to the locale. Where existing relict populations exist in or near the project area, new genetic material from other locations should not be introduced. Rather, it would be preferable to take cuttings, seeds, rootstocks, etc. from existing adjacent populations for project plantings. If no adjacent relict populations exist, then cautious use of plants from other populations on the same island may be used. Under no circumstances should plants from other islands be transplanted or otherwise grown on another island.

Finally, to minimize any adverse effects on wild populations due to uncontrolled public harvesting in the wild, plant lists should only include those for which commercial sources are available, or whose propagation from seed or cuttings is feasible. Any brochure or plant list must have clear warnings against the removal of plants from the wild, with reference to the relevant State and Federal statutes, ordinances and regulations prohibiting such removal.

POTENTIAL PROJECTS

A. Highway Landscaping

Many State and local highways have substantial rights-of-ways beyond the shoulder which would be ideal areas for planting projects. Interchanges, for example, have large areas around entrance and exit ramps. Appropriate plantings could be designed to provide noise control and visual relief for the traveler. Such planting should not impede drivers' sight lines or otherwise create unsafe conditions. Planting should also be located away from areas subject to destruction from future highway expansion. Even with these constraints, there are a number of areas in which native plantings could be used. For example, the H-1 extension from Waipahu to Makakilo could be planted with dry-land plants, such as wili-wili (Erythrina), lama (Diospyros), alahe'e (Canthium), ilima (Sida), and noni (Morinda). One or two demonstration projects should be developed to educate the public on the feasibility of the concept.

Species use in highway landscaping should be appropriate to the area to be planted, and must be low-maintenance. In dry areas, species adapted to xerophytic condition should be used.

B. School Landscaping

Currently, most schools are planted with species inappropriate to their environmental conditions. For example, schools located in dry areas may have plants such as kukui (Aleurites) or ti (Cordyline). In addition, landscaping is often carried out with alien species such as the octopus tree, the monkeypod and shower trees. Landscaping with native species would reduce maintenance costs, facilitate appreciation of native plants, and serve as a resource for the Hawaiiana curriculum. Appropriate species include naio (Myoporum), lama (Diospyros), koa (Acacia koa), and kolea (Myrsine).

C. Recreational Parks-State and City

Most State, County, and Honolulu City parks are located in areas with relatively dry environmental conditions. Substantial amounts of water are required to maintain these plantings. It is gratifying to see species the Hawaiians used, e.g., kou (Cordia subcordata), and native species, e.g., naupaka (Scaevola taccada) employed in landscaping. On the other hand, it is also common to see plantings of non-native species. Demonstration projects using nehe (Lipochaeta), Chenopodium, ma'o (Gossypium), akoko (Euphorbia), mai'a-pilo (Capparis), and tree species, e.g., wili-wili (Erythrina), naio (Myoporum), aiea (Nothocestrum), and Planchonella would be appropriate.

D. Undeveloped Public and Private Areas

Large areas of land in Hawai'i have had their native vegetation severely altered due to past agricultural practices and introduction of alien species. Many of these lands remain undeveloped and are not likely to be developed in the future because of topography, access problems, or potentially strong public opposition. For these areas, restoration of the original vegetation is a possibility. Examples of such areas include the ridges and planezes of the Ko'olau Mountains from St. Louis Heights to Koko Head: the lower slopes of the Waianae Mountains surrounding Kaena Point and extending to Mokuleia; and scattered stream valleys on O'ahu. On O'ahu, restoration is a particularly attractive concept because current feral animal influences are minimal or non-existent in many of the potential restoration areas (e.g., eastern portions of the Ko'olau range above Kuliouou, Niu and Hawaii Kai),and fencing to preclude feral animal depredation is not needed. Indeed, where relict populations of feral animals exist (primarily wild boar, Sus scrofa), it is reasonable to assume that a one-time sweep of the potential restoration area would be highly effective in eliminating such populations, given the already low populations that exist, as well as the high pressure placed on the populations due to public hunting. On other islands fencing may be necessary to prevent intrusion by feral animals. Such fencing should be located to take advantage of existing topographic features which impede intrusion by feral populations.

CONCLUSION

A program to encourage plantings of native plants for landscaping and to facilitate the restoration of degraded native ecosystems should be developed. The Hawaiian Botanical Society should take the lead in developing such a program.

ACKNOWLEDGMENTS

I would like to sincerely thank the following individuals for providing comments on drafts of this paper: Isabella Abbott; Evangeline Funk; Paul Higashino: Shirley B. Gerum; Randal Mew; David Miranda; Kenneth M. Nagata; and Keith Woolliams. Any errors or omissions, however, are attributable only to myself.

****

NOTES ON WEEDS IN HAWAII - IV

Clifford W. Smith, Botany Department, University of Hawaii.

Poaceae

Betsy Harrison-Gagné reports that pampas grass has been found growing wild along the road to Haleakala National Park. Action needs to be taken now to prevent this weed from spreading elsewhere.

Myrtaceae

Pimenta dioica (Allspice). Patti Welton reports that there are a large number of seedlings of this species spreading in the Waianae Kai area. There are some large trees in the macadamia nut area at the end of the dirt access road. Seedlings have also been seen on the trail from the ridge of Waianae Kai down into Makaha Valley.

MELICOPE (=PELEA) RUST: NEW DISCOVERIES ON MOKIHANA

Donald E. Gardner
National Park Service Cooperative Park Studies Unit
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
Honolulu Hawaii 96822

Earlier this year Ken Marr and I discussed two newly recognized rust fungi on Rutaceous hosts (Marr and Gardner, 1989). I have now formally described these rusts as Puccinia rugispora Gardner, the rust on Zanthoxylum dipetalum Mann, and P. rutainsulara Gardner, the rust on Pelea sp. (Gardner, in press). At that time, P. rutainsulara was known only from herbarium specimens labeled "Xenostele sp." in the National Fungus Collections (formerly Bureau of Plant Industry), Beltsville, Maryland (BPI). This rust, collected in Makaha Valley, O'ahu, by L. B. Loring and E. J. Ford in 1951, was on leaves identified as Pelea sp. In our report we noted that additional collections of this fungus would aid greatly in confirmation of this single record and contribute to our understanding of this apparently endemic fungus.

I recently found two listings in the files of the University of Hawaii Plant Disease Clinic (PDC) of rusts collected on mokihana (Pelea anisata) at Koke'e, Kaua'i. This species has recently been revised to Melicope anisata (H. Mann) H. Hartley & B. Stone (Hartley and Stone, 1989). The first collection, submitted to the clinic by S. Kashiwai on 5/23/1972 with the notation that "many" plants were affected, was of a rust which could not be specifically identified. The second, dated 7/25/1973, was of a rust identified as Kernella lauricola by Martinez and Baker. This second listing included the notation: "This is a new record for Hawaii, and possibly a new record of a rust on the Rutaceae." However, to my knowledge these collections received no further attention.

Since my publication (Gardner, in press) has been in press, I have found pustules of a rust resembling the previously examined "Xenostele" specimens from BPI on B. P. Bishop Museum herbarium (BISH) specimens of M. anisata. No notation had been made by the collectors of the rust itself, which was inconspicuous and probably overlooked. Rust material which was quite freshly developed at the time of collection was found on BISH sheet 513489, and older pustules on sheet 542030. It was particularly interesting that telia of the fresh material were often erumpent and still retained long columns of protruding, closely-compacted teliospores. This characteristic, not evident in the older BISH material nor in the originally examined BPI specimens, is rather distinctive among the rusts. It was probably the basis for reference of the rust noted in the PDC records to the genus Kernella, which is characterized by similar deep-seated telia with protruding columns of teliospores (Cummins and Hiratsuka, 1983). These observations indicate that the BISH specimens I examined represent the same rust referred to by the clinic. Some authors have treated Kernella as a synonym of Puccinia (Ragunathan and Ramakrishnan, 1973), but this genus was retained by Cummins and Hiratsuka (1983) because of the columnar telia.

Notwithstanding the columnar telia of the Hawaiian rust, I do not consider Kernella the proper genus. Kernella, like Xenostele, which is now usually considered synonymous with Puccinia (Cummins, 1949; Cummins and Hiratsuka, 1983), is limited to hosts of the Lauraceae. Furthermore, the teliospores of Kernella are morphologically distinct from those of the Hawaiian rust, being regularly horizontally septate. Teliospores of the Hawaiian rust are variable in form, with the pedicel frequently inserted obliquely or laterally as described for P. rutainsulara based on the BPI specimen as the holotype (Gardner, in press).

My recent observations provide desired confirmation of the occurrence of P. rutainsulara, earlier referred to as Pelea rust (Marr and Gardner, 1989), on Melicope and establish mokihana as a host. Although other species of Melicope may be anise-scented, in a strict sense the common name mokihana refers only to the species M. anisata, endemic to the island of Kaua'i (Neal, 1965; D. Herbst, Pers. comm.). Since the BPI specimen was collected on an unidentified Pelea (=Melicope) host from O'ahu, the host range of P. rutainsulara appears not to be limited to the Kaua'i range of mokihana, nor to that host species.

Although I do not consider the new rust to be a species of either Xenostele or Kernella, to which it had been earlier unofficially referred, the newly recognized columnar nature of fresh telia does lead to questions as to its proper placement. Based on the reasoning of Ragunathan and Ramakrishnan (1973), this telial characteristic is not sufficient to distinguish a rust from the genus Puccinia, in which species with two-celled teliospores are placed. On the other hand, retention of Kernella by Cummins and Hiratsuka (1983) on the basis of columnar telia indicates that if the Hawaiian Melicope rust does not belong in Kernella, it perhaps should be included in a separate, perhaps new, genus. For the present, however, the name *P. rutainsulara* is satisfactory for the new rust.

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* * *

MAUI BOTANICAL GARDEN THREATENED

The current site of Maui's Zoo and adjacent Botanic Garden is to be developed into a county fair site, culture and arts complex, and park. Any action on the Maui Botanical Garden will be a part of their decision on the Zoo. If the Garden is moved, many of its extremely rare native plants that Rene Sylva has spent so many years caring for with remarkable success would not survive. In other words, there is a distinct possibility this important collection would be lost.

The Native Hawaiian Plant Society itself started as support group for the Garden. As people who have a strong commitment to saving what is left of Hawaii's unique flora, we should try to save it. Call the Mayor's office at (808) 243-7855 (or your council people, if you live on Maui) to find out more about the Garden's future and the prospects for saving this valuable collection. Peter Connally, 2765 Iolani Street, PUKALANI HI 96768

VARYING PHENOLOGY OF O'AHU'S LOBELIADS

John K. Obata
1337 Ala Aolani
HONOLULU HI 96819

Many botanists have been puzzled by the variable flowering seasons of the native Hawaiian lobeliads. After many years hiking and studying in the mountains of O'ahu, I have come to appreciate the diverse, and somewhat unusual, nature of their phenology.

All of O'ahu's lobeliads have relatively distinct flowering seasons but this is somewhat modified by seasonal climatic changes. When the flowering season extends beyond the customary time frame, however, one questions the idea of a definitive "blooming season."

The explanation is rather simple when one periodically observes the same population during blooming and post-blooming seasons. It is a matter of multiple flushing flowers on the same inflorescence in different time frames. A single inflorescence will flush for two to three times in a season depending on the climatic condition and the vigor of the plant. "Reflushing" occurs about three months after the previous flushing. Reflushing generally occurs once, but the second "reflushing" is not that rare. Also, the second and third flushing are less vigorous with fewer flowers compared to the first flush. The third flush sometimes seems almost vestigial.

Some of my observations follow but they by no means reflect a definitive statement as not all species have been fully assessed. Generally speaking, the genera Lobelia, Rollandia and Trematolobelia are inclined to multiple flushing but this varies from year to year. Multiple flushing has not been observed in the genus Clermontia or Delissea subcordata. Only the species grimesiana and truncata exhibited this tendency in the genus Cyanea. Generally, those lobeliads with a heavy erect or lateral peduncles appear to produce multiple flushes.

In the genus Lobelia, this phenomenon was noticed in gaudichaudii, niihauensis, oahuensis and yuccoides. With Rollandia multiple flushing was noted with angustifolia, humboldtiana, lanceolata (calycina, waianaeensis) and st.-johnii. With Trematolobelia this phenomenon is the norm rather than the exception in macrostachys and singularis.

THE WEED WRENCH -- IT REALLY WORKS!

Peter Connally
2765 Iolani Street
PUKALANI HI 96768

A new tool for alien plant control was recently tested by the Native Hawaiian Plant Society. This tool, called a "Weed Wrench," was developed by volunteers at the Golden Gate National Recreation Area (California) to assist in the control of gorse (Ulex europaeus). The tool consists of a vice-like adjustable jaw mechanism at ground level, and a 5-foot handle. Rocking the handle forward opens the jaw, which on the large model opens to 2". Once the jaw is around the stem, the handle is pulled back, which causes the jaw to close on the stem with a claimed eighteen-to-one mechanical advantage. Further pulling on the handle uproots the plant with a lever action at a claimed six-to-one mechanical advantage. Heavy, medium and light duty models are available from the manufacturer, New Tribe, 3435 Army Street, No. 330, San Francisco, CA 94110, U.S.A. Telephone #(415) 647-0430. Current prices for the 3 models are:

Heavy	$140.00 + 47.00 shipping (UPS)
Medium	$110.00 + 37.00 shipping
Small	$ 90.00 + 28.50 shipping

A heavy-duty Weed Wrench was purchased and field-tested at the Hosmer's Grove area of Haleakala National Park. The first test was conducted on March 22, 1989 and targeted Pinus patula (Mexican Weeping Pine) and Eucalyptus globulus (Blue Gum). It was a sunny day, and the earth was dry. The pines ranged in size from seedlings to saplings with 2-inch diameter stems. Most were 6 to 10 feet tall. Approximately 75 were pulled in 5 hours. If the Weed Wrench could grasp the stem, the plant could be pulled up. The eucalypti were also saplings with 2-inch diameter stems. These plants seemed easier to remove than the pines. About 15 eucalyptus were removed in one hour.

The second test was conducted on March 26 on gorse. Again, if the stem of the gorse plant could be grasped by the Weed Wrench, it could be pulled up. Almost all of the gorse in this test had been chopped off at ground level in previous alien plant control projects. With such plants, the stem often snapped off at ground level just above the previous cut. This left the roots and a large basal stem at ground level. With a little grubbing around the stem to give the Weed Wrench something to grip, the root could be removed. Once such plant had a basal stem at ground level of 2-inch diameter and radial roots that extended six feet. It took 15 minutes to remove this plant making repeated pulls. Approximately 80 gorse plants were removed in 2 hours.

Positive characteristics of the Weed Wrench are:

1. It is very effective in removing weeds with woody stems up to the rated size of the tool.

2. Control is complete. The entire stem and roots are removed, eliminating the possibility of resprouting/coppicing. This reduces the need for follow-up control activities.

3. It provides managers and volunteers with an alternative to chemical control.

4. The Weed Wrench does not disturb the ground as much as grubbing so nearby native plants can be spared.

5. It is safer than chemicals, chain saws, or chopping tools, which is an important consideration when using volunteers.

6. While using the Weed Wrench is not easy, it is certainly easier than grubbing with a pick and shovel.

The only negative characteristic is the weight; the heavy-duty model weighs 21 pounds. However, the medium and light duty models weigh 17 and 11 pounds, respectively.

As a result of these tests, the Division of Resources Management for Haleakala National Park has ordered 3 each of all models for alien plant control use. Other organizations involved in alien plant control should consider purchasing and using the Weed Wrench. Potential targets of control include other pines and eucalypts, Lantana camara, Leucaena leucocephala, Myrica faya, Psidium cattleianum, P. guajava, Schinus terebinthifolius, and larger individuals of Clidemia hirta.

TREE SEEDLINGS SPECIES DISTRIBUTED BY STATE TREE NURSERY

The Kamuela State Tree Nursery distributed approximately 378,000 tree seedlings throughout the State during Fiscal Year 1988-89. Seedlings were distributed to the public and to the Division of Forestry and Wildlife (DOFAW) for windbreak, timber, Christmas tree, wildlife, biomass and soil conservation plantings. Eighty-two percent of these seedlings were planted on the island of Hawaii (an average of three seedlings per resident).

Tree seedlings (see table below) are available from the DOFAW. Each seedling costs 10 cents (minimum order of $5.00). To order, please call the Hilo office at 961-7221. Your order will be placed on a list (first come, first served basis) and as the seedlings become available you will be contacted by mail to make payment. The payment and pick-up of seedlings must be made by the dates specified on your notification, or your order will be cancelled and/or money forfeited. You may arrange to pick up seedlings in Hilo or at the Kamuela Tree Nursery.

Tree Seedlings Distributed During Fiscal Year 1988-89

Scientific Name	Common Name	Number of Seedlings
Acacia koa	Hawaiian Koa	151,971
Araucaria heterophylla	Norfolk Island Pine	20,028
Casuarina cunninghamiana	Ironwood	36,515
Casuarina equisetifolia	Shortleaf Ironwood	33,128
Cryptomeria japonica	Japanese Sugi	3,325
Cupressus lusitanica	Mexican Cypress	26,502
Cupressus macrocarpa	Monterey Cypress	14,834
Eucalyptus citridora	Lemongum	2,399
Eucalyptus deglupta	Rainbowbark	6,685
Eucalyptus globulus	Bluegum	1,610
Eucalyptus grandis	Rosegum	8,437
Eucalyptus paniculata	Gray Ironbark	1,670
Eucalyptus robusta	Swamp Mahogany	1,868
Eucalyptus saligna	Floodgum	1,125
Melaleuca leucadendron	Paperbark	5,642
Olea europea	Wild Olive	10,456
Pinus elliottii	Slash Pine	3,752
Pinus radiata	Monterey Pine	26,658
Pinus taeda	Loblolly Pine	11,568
Sequoia sempervirens	Redwood	4,282
Tristania conferta	Brushbox	6,268
	TOTAL	378,723

HAWAIIAN BOTANICAL SOCIETY
Minutes of the May 1989 Meeting

The meeting was called to order at 7:30 pm. The minutes of the April meeting were not read. The Treasurer's report was not available.

President Mark Merlin announced that the Society awarded copies of the book Plants and Flowers of Hawai'i by S.H. Sohmer and R. Gustafson, and $50 as prizes to each of the Society's three winners at the Hawaiian Science and Engineering Fair. In the Junior Division, Dianella Howarth, of Moanalua Intermediate School, won for her project, "Reproduction of Scaevola sericea." Gar Ling Tse and Lorene Sato, both from Castle High School, won the Senior Division for their respective projects, "Characterization of Allochemicals from Eremochloa ophiurides", and "The Biological Control of White Rust on Chinese Mustard Cabbage".

Under new business, President Merlin announced that the Board of Water Supply will be encouraging people to plant xerophytic plants, which require minimal watering.

Vice-president Marie Brugeman introduced the Plant of the Month Speaker Ken Marr, M.S. candidate in the U.H. Botany Department. He spoke on taxonomic problems in the Hawaiian species of Zanthoxylum (Rutaceae). The new manual recognizes four species in Hawaii. Trees are quite variable in morphology. Some taxa have distinctive lemon or anise odor. The Hawaiian species are on the candidate list of endangered species.

Marie Brugeman introduced the Speaker of the Month, Dr. Art Whistler, ethnobotanist at the National Pacific Tropical Botanical Garden. His topic was "Tongan Herbal Medicine." He introduced his talk by describing the geography of Tonga, 269 square miles of limestone and volcanic islands. In the Tongan tradition illnesses were either supernaturally induced or resulted from obvious causes such as broken bones. Historical records indicate that some early medical practices were derived from Fiji. Today Tongan medicine falls into three categories - Folk Medicine, Specialized Traditional Medicine practiced by a Faito'o, and Western Medicine. He described the medicinal uses of many plants, and illustrated his talk with many beautiful slides of Tongan plants, landscapes, and scenes of village life.

The meeting adjourned at 9:15 pm and refreshments served.

Respectfully submitted
Patti Welton, Secretary.

HONOLULU, HI
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Harvey Cushing MD
USA 45

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
HONOLULU HI 96822

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

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* * *

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The Society year is from December 1 through November 30 of each year.

Regular Membership is $7.50 per year.
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RESTORATION OF A *MARSILEA VILLOSA* POPULATION: EXPERIMENT IN WEED MANAGEMENT

Lyndon Wester
Department of Geography
University of Hawai'i at Mänoa
2424 Maile Way
HONOLULU HI 96822

INTRODUCTION

A project to protect and restore one of the two surviving natural stands of the endemic water fern, *Marsilea villosa* Kaulfuss, on the flank of Koko Head, O'ahu, was initiated by the Hawaiian Botanical Society and the Nature Conservancy of Hawai'i in 1987 in cooperation with the City and County of Honolulu, Department of Parks and Recreation. The population extends over about a half hectare in a small volcanic crater. Observers over several years have noted the *Marsilea* was suffering damage from off-road vehicles and becoming choked by weeds. Barriers were erected to exclude vehicles and a survey of the small savanna was conducted to determine the nature and intensity of weed infestation. When an experiment showed that *Marsilea* responded positively to the removal of competing weeds, a plan for management by controlled weeding was developed and initiated in spring 1988 (Wester and Ikagawa 1988). Treatment with herbicides were discussed but, because of the rareness of wild populations of *Marsilea*, it was decided not to risk the possible negative effects until all other possible measures had been exhausted.

Parties of volunteers did selective weeding approximately every two weeks under the direction of the author or personnel from the Nature Conservancy of Hawai'i from March to June 1988 and again from November 1988 to May 1989. In the 1988-89 season 183 hours were spent hand weeding and ten hours with a weed cutter. The mat-forming vine *Merremia aegyptia* (hairy merremia) and the tall herb *Xanthium strumarium* (cocklebur) were completely excluded from the *Marsilea* stand. Grasses, particularly *Echinochloa colonum* (jungle rice), *Setaria verticillata* (bristly foxtail), *Trachachne insularis* (cotton top) and *Panicum maximum* (Guinea grass), were also abundant but as removal of these species was much more time consuming efforts were focussed on certain sites.

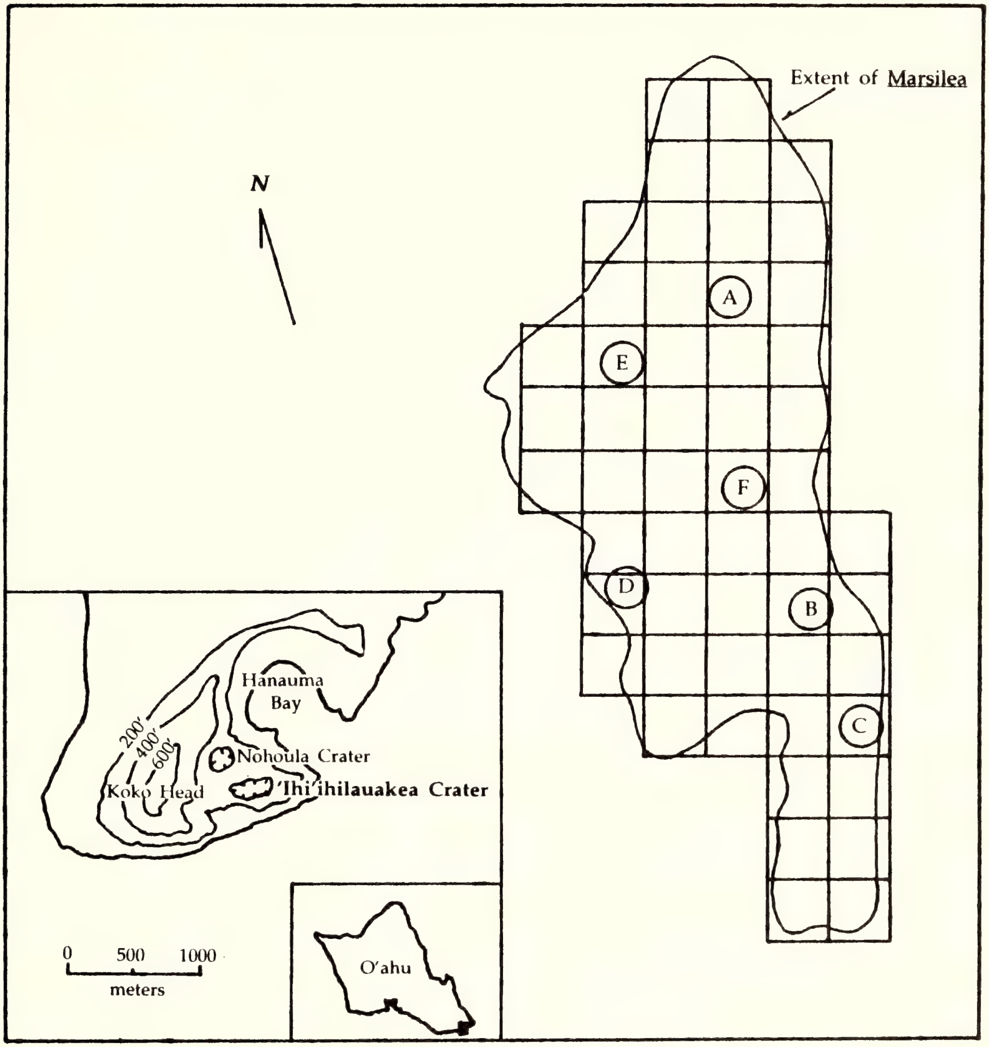
The rainfall on O'ahu from 1983 to 1987 was below average but the two following years were wetter than normal. A particularly heavy rain on New Year's Eve 1987 flooded the bottom of the crater for several weeks killing most of the perennial species. (Anyone knowing of previous floods are requested to contact the author). Marked improvement in the condition of the Marsilea was noted. Factors which might account for this include higher than average rainfall, the cessation of disturbance by vehicles or the weeding. The purpose of this study was to measure the response of Marsilea to the removal of weeds and determine whether the effort expended in hand weeding was justified.

METHODS

Four points were selected using a stratified random sampling procedure and two others were located to ensure representation of a Cynodon and a Chloris dominated community (Figure 1). A pair of 1 x 1 meter square quadrats were selected where the plant cover appeared to be of similar and homogeneous character. They were permanently marked and the cover of all species in both quadrats was determined with the use of a point-intersect frame. Pins dropped at fifty regularly located points in a 5 x 10cm grid pattern were found to provide consistent measurements. All species but Marsilea were removed from the quadrat with the lowest Marsilea by pulling individual plants by hand. A tool was used to cut roots of perennial grasses where pulling would cause excessive disturbance of the soil and Marsilea root mat. All plots were resurveyed several times during the growing season. The first drenching rains of the season occurred on 3 and 5 November when respectively 5.1 and 3.3 centimeters of rain were recorded in a rain guage at 25 Lumaha'i St. Sampling began 12 November 1988 (day 1) and continued until 20 May (day 189) by which time most of the annuals had set seed and begun to die back. One plot (F) was started later in the season for the purposes of monitoring the effect of treatment with a motor driven weed cutter.

RESULTS

Marsilea cover at the time of first sampling ranged from 14% to 78%. At least some bare ground was encountered at all sites and in one place was as high as 66% early in the growing season. A total of 14 species was encountered in the survey, all of which had been found in the general survey of the previous year (Wester and Ikagawa 1988). Cover estimates taken during the middle of the growing season (between December 18 and February 18) showed that Echinochloa was the main weed in sites A and E, Chloris in sites B, C and F and Cynodon in site D (Table 1).


Extent of Marsilea
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B
C
Hanauma Bay
200'
400'
600'
Nohoula Crater
Koko Head
'Ihi'ihilauakea Crater
0 500 1000
meters
O'ahu

Figure 1. Location of study area and sample plots.

Table 1. Species composition of sites in mid growing season. (Data represents samples taken between 18 December and 18 February).

	Species cover					
	A	B	C	D	E	F
Marsilea	18	20	92	54	46	16
Echinochloa	78		2		48	8
Chloris		52	6			70
Cynodon				44		
Merremia	4				2	
Phaseolus		4				
Bidens		2				
No plants		22		2	4	6
TOTAL	100	100	100	100	100	100

A sharp change in species dominance was noted between the first and second season of observation (Table 2). Since different sampling methods were used in the two cases, the results must be interpreted cautiously. *Echinochloa* had been the conspicuous dominant weed in all but one of the six areas in early 1988 by Wester and Ikagawa (1988), but *Chloris* had the highest cover in three sites by 1989. *Cynodon*, which had been the dominant weed around site D in 1988, remained so the following year.

Table 2. Comparison of dominant weed species in 2m x 1m sites sample in 1988-89 with the corresponding 10m x 10m areas samples in 1987-88.

Site	Dominant weed in 1988 (Wester and Ikagawa 1988)	Dominant weed in 1988-89
A	Echinochloa	Echinochloa
B	Echinochloa	Chloris
C	Echinochloa	Chloris
D	Cynodon	Cynodon
E	Echinochloa	Echinochloa
F	Echinochloa	Chloris

Change in the relative cover of Marsilea is compared to that of all other species in the control and weeded plots (Figure 2). In all instances a marked drop in weed cover, and a contrasting increase in the Marsilea occurred in the weeded plots. Over the course of the growing season the weed cover grew back to some extent. However even at the end of the growing season Marsilea cover in the weeded plots were all higher than in the contol plots. (Table 3). In contrast the weed cover in four of the six weeded plots (A, B, C and F) never achieved the same extent as in the companion control plot. In the other two plots (D and E) the weed cover in the weeded and control plots were equal at the end of the growing season. Weeding had the greatest effect at site A where the treatment was done very early in the growing season just a few days after the initial drenching rains of the season. On the other hand, recovery of weeds was most complete in plot D dominated by Cynodon. The supression of weeds in plot E appears low in Table 3 because the weed cover in the weeded quadrat was initially very much higher than that in the control site.

Table 3. Difference between cover of Marsilea and other species in weeded and control plots near the end of the growing season. Values were determined by subtracting cover in the control plot from cover in the weeded plot.

Site	Date of final measurement	Days between first and last measurement	Percent cover Marsilea	Percent cover All other species
A	March 4	112	+41	-54
B	March 18	100	+14	- 8
C	May 20	163	+18	-18
D	April 15	118	+ 4	0
E	April 15	118	+ 2	0
F	May 20	98	+16	-18

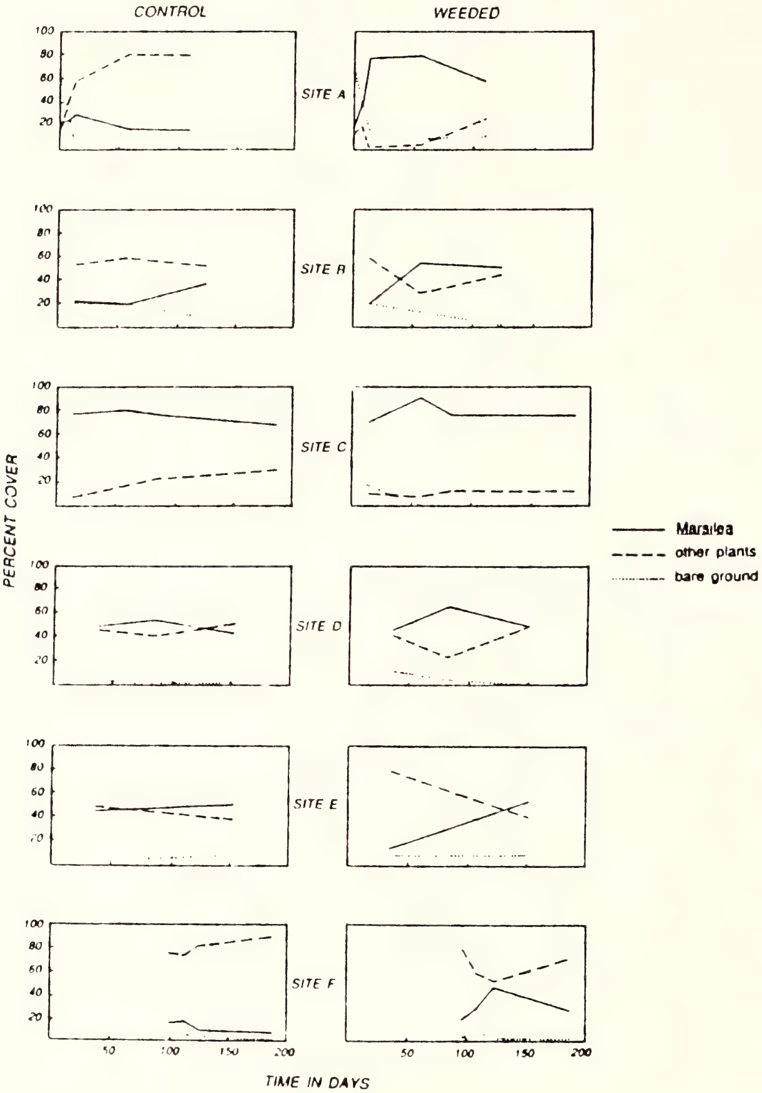

Figure 2. Change in species cover in weeded and control sample plots in the growing season of 1988-89.

DISCUSSION AND CONCLUSIONS

Weed composition in the Marsilea savanna showed some important changes from one winter to the next. The flooding in 1988 killed perennials such as Sida fallax, Panicum maximum, Phaseolus lathroides and Chloris barbata. On the other hand Echinochloa, a plant adapted to wet soils and tolerant of submergence, grew in abundance. Setaria verticillata was also very common. No flooding occurred in the winter of 1988-89 and Echinochloa, so conspicuous the previous year, was abundant but less common, and Setaria was a very minor element. In contrast many seedlings of Sida were observed and Chloris barbata, apparent only late in the 1987-88 winter, was very common throughout the 1988-89 season.

The physical disturbance of pulling weeds does not seem to be a concern for management of Marsilea because the fern invariably grew rapidly after these treatments. Although 183 hours were expended in hand weeding in the 1988-89 season this was not sufficent to cover more than a fraction of the total area of the Marsilea stand.

The perennial Marsilea seems to begin growing very quickly after winter rains and hand pulling of weeds at this early stage seems to have the most marked and long lasting effect. The supression of weeds by one such treatement lasted all season but a second weeding in mid-season would be desirable to remove regrowth. The species supressed the least by weeding was Cynodon. As it is not practical to remove the plant's deep rhizomes, regrowth is rapid and the long term effect of weeding is minimal. Fortunately the Cynodon population in Ihi'ihilauākea Crater does not seem to be spreading rapidly and so is not a serious threat to the Marsilea sward.

The treatment with a weed cutter is clearly beneficial and an efficient form of management since the whole Marsilea stand could be cut in two or three hours. However to obtain maximum benefit treatment on a monthly basis would be desirable since the weeds regrow more rapidly than after hand pulling.

ACKNOWLEDGEMENTS

The author wishes to thank the volunteers who gave their time an energy to weed the Marsilea stand and those people from the Hawai'i Botanical Society and Nature Conservancy of Hawai'i who assisted with the organization of our work groups.

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HAWAIIAN BOTANICAL SOCIETY
Minutes of the June 1989 Meeting

Vice-president Marie Bruegmann called the meeting to order at 7:30 pm. The minutes of the April and May meetings were read and approved. Derral Herbst read the Treasurer's Report.

The winners of the Science Fair were again congratulated. Shirley Gerum was welcomed as a new member.

There was no old or new business to discuss.

The Plant of the Month Speaker was Isabel Meneses, a Ph.D candidate in the Department of Botany at UH. She spoke about Gracilaria, a cosmopolitan genus of red algae. The Japanese call this seaweed ogo, and the Hawaiians manauea. Local consumption has resulted in overharvesting and there are serious concerns about its future abundance. A public education program has begun and regulations are being considered to restrict its harvest. There are 6 species in Hawai'i, 6 in California, and several more in Japan and the Philippines. It is collected commercially for agar. Dr. Maxwell Doty has been growing some species under controlled conditions for a long time. The plants grow readily from vegetative fragments.

The Speaker of the Month was Bill Garnet, superintendent of collections at Waimea Arboretum and Botanical Garden. His topic was "The Work of the Private Garden in Hawaii in Conserving Native Plants". Waimea Garden encompasses 18,000 acres, 70 of which are cultivated with over 6,000 plants. There are 32 gardens representing world, ethnobotanical, and generic collections. One highlight, the Hibiscus Evolutionary Garden, contains 600 different hybrids. He also spoke about a recent Conference for Botanic Gardeners in Réunion.

The meeting adjourned at 9:00 pm and refreshments served.

Respectfully submitted
Patti Welton, Secretary.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the October 1989 Meeting

The meeting was called to order at 7:35 pm. President Mark Merlin welcomed everyone back from the long summer vacation. The minutes of the June meeting were read and approved. No Treasurer's report was presented.

President Mark Merlin announced that the wife of Oscar Kirch donated $1000 to the Society in honored the memory of her husband, a long-time member of the Society.

Don Gower reported the following new members: Stephanie Aschman, Joseph Krahulick, Timothy J. Motley, Keali'i Kiamoku Pang, Diane Ragone, and Grant Uchida. All were approved by acclaim.

Under old business, President Merlin announced that the Xeroscape Garden at the Halawa Board of Water Supply opened Saturday, September 30. A special field trip to the garden for Society members and friends was suggested, to allow plenty of time to discuss the program with the local manager. President Merlin suggested that he could arrange a visit to see the goundwater shaft as well.

Under new business, Steve Montgomery made some announcements. He said that there was a partial silver lining in the H-3 freeway project. One fourth of one percent of H-3's Landscaping cost must be spent on native plants. He urged those who grow native plants to assist with this effort. To get more facts about the program, I called the Federal Highway Administration's Design branch, and the consultants who will landscape the area. They seemed interested in cooperating. I will propose that a Committee from the Botanical Society be set up to advise the landscapers.

Steve also reported on the status of the listing process for Hawaii's endangered plants. In 1975, the Smithsonian published a report on the situation in Hawai'i. They recommended a list of native plants that needed protection. The U.S. Department of the Interior adopted the list as a petition which they have failed to process since that date. At present, 15 plants are federaly listed as endangered. Part of the MacArthur grants to Hawaii has been awarded to the Sierra Club Legal Defense Fund to study why nothing is happening. The Sierra Club has been working with the U.S. Department of the Interior as much as possible in order to avoid going to court to force the Department to carry out its mandate. The Department has offered a compromise by promising to list 20-30 plants as endangered. The Sierra Club thinks this is too low, and will take the issue to court unless the Department considers a more aggressive policy toward listing.

President Merlin announced the need for a member volunteer to be in charge of getting papers for the Newsletter. Clyde Imada, who currently holds this position, may resign at the end of this year.

A call for nominations for Society officers for 1990 was made. The slate will be announced in November, and elections will take place at the December meeting.

The Plant of the Month speaker was Zella Ellshoff. She is the botanist at Foster Gardens, and a Ph.D candidate in the Department of Botany at UH. She showed slides of Prairie Plants of Ohio. There are only about 300 small patches comprising 1000 acres left in the state, mainly in Madison, Columbus, and Dayton Counties. Some experimental plantings with wildflowers have been conducted. The genetic erosion of the species is greater from the north to the south than it is from east to west.

The Speaker of the Month was Dr. Fred Ganders, from the Botany Department of the University of British Colombia, Canada. He is on sabbatical leave this year, and is a visiting professor in the Botany Department at UH. His topic was "Adaptive Radiation in Hawaiian Bidens (Asteraceae)" in which he summarized 10 years of work. Bidens is a worldwide genus. Dr. Ganders recognizes 19 species in Hawai'i and 8 subspecies. He showed slides of the ecological and morphological diversity within Bidens. He believes that the progenitor of Hawai'i's species arrived to the Islands before Kaua'i was above sea-level. He thinks that the progenitor might be a vine species from Mexico, rather than one from the west coast of North America. He plans to collect some specimens in Mexico and Costa Rica during the second part of his sabbatical.

The meeting was adjourned at 9:00 pm. Unfortunately, the members were not able to enjoy the usual refreshments due to a misunderstanding, but they were promised for the November meeting.

Respectfully submitted,
Patti Welton, Secretary.

HAWAIIAN BOTANICAL SOCIETY
Minutes of the November 1989 Meeting

President Mark Merlin called the meeting to order at 7:35 pm. The minutes of the October meeting were read and approved.

President Merlin announced the proposed slate of new officers for the Botanical Society. The nominees were Lyndon Wester for President, Don Drake for Vice-President, Derral Herbst for Treasurer, and Benton Pang for Secretary. Elections will be held at the December meeting.

President Merlin announced that a date had not been arranged yet for society members to visit the Xeroscape Garden at the Board of Water Society Halawa Station.

Steve Montgomery reported for the Sierra Club Legal Defense Fund on a law suit filed against the Department of the Interior for poor support on protecting Hawaii's native species. Aid from the Society was requested; a motion for $300 passed.

President Merlin introduced the Speakers for this month because Vice-President Marie Bruegmann was visiting her 92 year old grandmother in Hannover, Germany, while the East Berlin wall was tumbling down. Plant of the Month Speaker was Dr. Arthur Whistler, who spoke about the genus Gardenia in Polynesia. It is an Old World genus with about 250 species, most of which are in Africa and Asia. There are 7 species in Polynesia. Four of these are endemic to the Hawaiian Islands.

Speaker of the Month was Diane Ragone. She is presently finishing her doctoral thesis in the Horticultre Department at the University of Hawaii. Her Topic was breadfruit. Her interest began when she worked in Western Samoa in 1985 and realized not much comprehensive work had been done comparing the varieties of this important food source for the islanders. She has collected cuttings from 40 islands in the Pacific and has compared them using genetic markers. She showed many interesting slides of these varieties as well as the scenery where she went to collect them.

The meeting was adjourned at 9:00 pm. Refreshments were served.

Respectfully submitted,
Patti Welton, Secretary.

NAIO RUST REDISCOVERED

Donald E. Gardner
National Park Service Cooperative Park Studies Unit
Department of Botany
University of Hawaii at Manoa
3190 Maile Way
Honolulu, Hawaii 96822

In September, 1989, I discovered what I considered to be a previously unknown rust fungus on leaves of naio (Myoporum sandwicense Gray) near the lower Mauna Loa Strip road, Hawai'i Volcanoes National Park (HAVO). Infection was evident as small (1-mm diameter) brown raised sori (pustules) on the undersurfaces of the leaves. Only uredinial sori have been found thus far. Although individual sori were rather inconspicuous, many leaves were heavily infected, causing the disease itself to be more noticeable.

The naio rust was not listed by Stevens (1925) and was not found in previous searches of the herbaria considered most likely to contain Hawaiian fungi (BISH, HAW, HONQ, BPI) (Gardner and Hodges, 1989). Whereas I have frequently consulted the Arthur Herbarium (PUR) at Purdue University, which specializes in rust fungi, that herbarium is not yet "computerized" to permit searches for material from specified geographic regions, such as Hawai'i. Upon receipt of my recently collected naio rust, Dr. Joe Hennen, curator of PUR, informed me that he had found a scanty collection of a rust on M. sandwicense on deposit at PUR. The specimen had been collected in 1946 by D. P. Rogers at Parker Ranch on the island of Hawai'i. Dr. G. B. Cummins, then at Purdue, had formally described and named the rust as Uredo myopori Cumm. in 1952, based on Rogers' material (Cummins, 1952). The description was published together with those of 46 other newly recognized, but unrelated, species of rusts from other regions of the world. From Cummins' description it is evident that the rust I collected in HAVO represents U. myopori, and is apparently the only record of this species other than the type material. Cummins noted that the only rust recorded on the Myoporaceae previous to U. myopori was Aecidium myopori Cunn. in New Zealand (Cummins, 1952).

Since the description of U. myopori had been overlooked in compilations of Hawaiian botanical literature, this species was not included in previous discussions of endemic rusts (Gardner, 1987; Gardner and Hodges, 1989). However, based on its occurrence on an endemic Hawaiian host and the lack of obvious close affinities to other rusts, U. myopori may be considered an addition to Hawai'i's endemic rust flora. I have deposited specimens at B. P. Bishop Museum (BISH 548135-6).

Stevens (1925) placed considerable significance on the apparent scarcity of endemic rust fungi among Hawai'i's native mycoflora. Whereas this scarcity is still noteworthy (Gardner, 1987), discoveries of several (eight) presumably endemic species since Stevens' observations (Cummins, 1937; Gardner, 1988, 1990; Hennen and Hodges, 1981; Hodges and Gardner, 1984; Marr and Gardner, 1989) cause the paucity of Hawaiian species to be perhaps less striking.

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BOTANICAL CONCERNS OF RECENT EVENTS AT PŌHAKULOA TRAINING AREA

Dr. Lani Stemmermann
P.O. Box 308
Volcano, Hawaii 96785

Recently while attempting to locate a field site for current research on Native Dry Forest community dynamics I visited an area at Pōhakuloa Training Area (PTA) on the island of Hawai'i where a Multipurpose Range Complex (MPRC) is being constructed. Since this major construction project is federally funded, compliance with the National Environmental Protection Act (NEPA) is required. An Environmental Assessment (EA) was conducted with a Finding of No Significant Impact (FONSI). Consequently no Environmental Impact Statement was prepared despite the large scope of the project (1,200+ acres) and obvious, approximately $16 million, irreparable damage to an intact native forest system.

This area in fact has attributes more suited for a State Natural Area Reserve than a highly impacted military training area.

- The south-west portion of PTA where construction is occurring is an area where average annual rainfall is 15 inches. The area is vegetated by a mosaic of native forest communities. Most areas of similar rainfall in the Hawaiian Islands tend to be vegetated by shrub vegetation and usually are disrupted by the invasion of alien species of plants and animals.

- Of particular interest at PTA is the mosaic of montane dry forest communities present. Patches of relatively ancient lava (more than 4,000 years old) are juxtaposed with far more recent flows. A closed canopy naio forest grows on the older lava flows and a montane 'ōhi'a dry forest occurs on the more recent lava flows. The naio dominated community survives under the very dry conditions at PTA and is not found elsewhere in Hawai'i. It is unique to the PTA area, being an extreme phase of the mamane-naio forest which occurs under relatively more mesic conditions on the slopes of Mauna Kea. The very old lavas upon which this community are situated are a rare volcanic feature on these upper slopes of the geologically active Mauna Loa. The montane 'ōhi'a dry forest is virtually weed free and though similar sorts of forest can be found elsewhere, such as at Hawai'i Volcanoes National Park, the PTA forest of this type is more intact than anywhere else.

- Areas where native plant communities occur in a mosaic on juxtaposed ancient and recent substrates are of great scientific interest. Recently the National Science Foundation funded a joint Stanford University--University of Hawaii proposal to study Hawaiian ecosystem development ($1.3 million over 5 years). Such studies depend upon the described mosaic where nearby communities occur under similar climatic conditions, and differ only in their species composition and substrate age.

- Also of particular interest at PTA is that these communities are viable--that is the dominant species are reproducing and these communities are consequently capable of self-maintenance. Most ecologists believe that viable communities are much more ecologically valuable than endangered species _per_ _se_. Rare species are sometimes found in completely disrupted ecosystems and may never survive without man's intervention. In contrast, communities which can maintain themselves from the matrix which supports the rarer elements in addition to other ecosystem components upon which they depend (such as pollinators, for instance).

- Tropical Dry Forest Communities are the most endangered of all tropical forest types. Hawaiian dry forests are particularly so. Few of them exhibit active reproduction, and fewer exist in a mosaic where various substrate ages insure that communities at all stages of successional development co-exist so that the system dynamics can be preserved.

- In addition to the two communities directly impacted by the MPRC under construction, there are four other communities unique to PTA. The _Dodonaea_-_Dubautia_-_Bidens_ scrub and _Euphorbia_ forest at Kipuka Kalawamauna harbor the highest concentration of officially listed endangered plant species in Hawai'i. The _Eragrostis_ grassland and _Chenopodium_ scrubland along the Saddle Road are also unique to the Pōhakuloa Area--found nowhere else in the world.

- The number of unique vegetation units found at PTA, the juxtaposition of these communities, the intact nature and viability of these communities are all attributes that make the PTA area particularly suitable as consideration as a Natural Area Reserve. Instead a major training facility is being constructed in the absence of an EIS.

- The project under construction is situated principally within the naio forest. Fires are often associated with military training ranges. Fire through this area will foster invasion by alien weeds, particularly fountain grass which will serve to perpetuate the fire cycle within the level the existing trees. The infantry training range is designed such that movable pop-up targets will appear amidst a forest to "surprise-ambush" approaching troops. Once this forest is leveled through use of the range it will recover very slowly--or more likely not at all--given the areas very low rainfall.
- There are several very old archaeological sites known in the vicinity. Unfortunately, the area in which construction is taking place has not been thoroughly surveyed.
- It would be more appropriate to situate such a range in an area where plants were grown specifically for the purpose of providing cover during exercises. This is not possible in an area of 15 inches of annual rainfall.
- I am now, with the help of the Moku Loa Group of the Sierra Club, attempting to get an injuction against ongoing construction at the PTA MPRC until an appropriate EIS has been prepared. The Sierra Club Legal Defense Fund (212 Merchant Street, Suite 202, Honolulu, Hawaii 96813) is now accepting donations to cover litigation costs (specify PTA defense).

We known that Hawai'i has already lost countless species, and numerous habitats. There are almost always alternatives to impacting native systems. We know that habitat destruction is a global problem. As concerned botanists, it is our duty to advise against consumptive and destructive uses of intact communities. There are sufficient disturbed lands in Hawai'i for man to restrict his activities to those areas and still fulfill his needs.

For those of us who on occasion engage in biological surveys--it is important that we consider the ecological value of intact communities, and the consequences of proposed activities on the maintenance of those systems. It is almost always easier to prevent something from breaking than fix it once its broken.

For those employed by agencies responsible for signing off on project proposals--it is NEVER acceptable to imply or accept a FONSI from an EA when major impacts are being imposed upon intact native plant communities, regardless of the presence or absence of endangered taxa.

For those who don't engage in surveys, and aren't employed in responsible government positions--its important that we remain vigilant. We must seek to encourage an understanding of the value of ecosystem maintenance amongst our professional colleagues and others.

Finally, I would like the Society to consider nominating the above area as a State Natural Area Reserve.

NOTES ON WEEDS - 5

Clifford W. Smith

Asteraceae

Linda Cuddihy reports Senecio mikanioides (German Ivy) from Manukā Natural Area Reserve in South Kona. It is also present in Hakalau National Wildlife Refuge in the gulley downslope of Pu'u Ākala/Aweli'i Stream with Ilex aquifolium (English holly).

Melastomataceae

Paul Higashino notes that Tibouchina herbacea infestation on West Maui has intensified. It is well established in the forests around Pu'u Kukui as well as in the bogs. Some of the plants are well over 7 feet tall in the lower forest areas.

Papaveraceae

Linda Cuddilly reports Hunnemannia fumariaefolia (Mexican tulip poppy) along the roadside near Ocean View Estate. There is some question if it is naturalized in the area. Society members are asked to look for more specimens when in the area.

A specimen is on deposit in Hawaii Volcanoes National Park herbarium.

Poaceae

Betsey Harrison-Gagné reports that *Cortaderia selloana* (pampas grass) was found growing on a cliff above Halemau'u Trail in Haleakalā National Park.

Ron Nagata reports that *Melinis minutiflora* (molasses grass) was found in Kaupō Gap at 6,000 ft. This is a new elevation record.

Evaneline Funk reports that *Schizachyrium condensatum* (Kunth) Nees, was found growing in Wai'oli Valley, Kaua'i. The area which had been the site of a major forest fire in 1967.

Solanaceae

Paul Higashino reports that *Datura arborea* (Angel's trumpet) is growing wild in the streams of Pelekunu Valley, Moloka'i. This is apparently the first report of this species established in the wild.

Two papers that may be of interest:

Cook, Michael J. 1987. Eucalyptus Control. State of California Department of Parks and Recreation. 37 pp.

This report discusses the biology of the species found in California. It then goes on to review the physical and chemical control procedures that are available. This section is then followed by a short section on biological control. A very interesting discussion on the impacts of control concludes the report. This latter section was fascinating because of the breadth of issues discussed: visual; wildlife; noise and traffic; hydrology; soils; microclimate; vegetation and safety.

Doren, R. F., & L. D. Whiteaker. 1990. Comparison of Economic Feasibility of Chemical Control Stratefies on Differing AGe and Density Classes of *Schinus terebinthifolius*. Natural Areas Journal 10:28-34.

Many of us will remember the junior author when he was a member of the Society. This is a thorough evaluation of chemical control of Christmasberry. Part of the program was to kill female trees only. They found that it took just as much time and cost as much as treating all trees.

BOOK REVIEW

THE EUROPEAN GARDEN FLORA Volume I
Pteridophyta, Gymospermae,
Angiospermae - Moncotyledonae
(part 1). 1986.
Edited by S.M. Walters et al.
Cambridge University Press
32 East 57th Street, New York, NY 10022
ISBN 0-521-24859-0. 430pp
$105.00 clothbound

It was announced in 1981 that a project, with the ambitious goal of describing all plants grown out of doors and in glasshouses throughout England and Europe, was being initiated. It is a pleasure to review here the first volume of this European Garden Flora (hereafter referred to as EGF).

Why would Hawaiian gardeners and botanists find a series of books on European cultivated plants of interest? Quite simply because the EGF aims to cover about 25,000 taxa in the six volumes projected to complete the job, and there is a high percentage of overlap between the plants grown indoors or in conservatories in temperate Europe and those grown outdoors in Hawai'i. Regretfully, there is no comparable project underway or even in the planning stages for North America, so by default the EGF will become the most comprehensive and up-to-date reference work available to those interested in cultivated plants grown in the United States.

The series has been well-planned, and provides a great deal of information in a space-efficient format. One unfortunate point is the choice of a systematic (evolutionary) classification for the order of families, genera, and species. Although the sequence followed is a well established one (Engler & Prantl's system as emended in 1964), any purported phylogenetic sequence is arcane and difficult to follow for all but a professional taxonomist, and that is a shortcoming for a series such as the EGF, which ought to enjoy a wide audience. A simple alphabetical arrangement is more intuitive to use and would make information much more readily accessible to the non-botanist.

Volume one covers the pteridophytes (ferns), gymnosperms (conifers and cycads), and part of the moncotyledons.

Descriptions are provided for each of these higher taxa, as well as the families, genera, and species assigned to each. Descriptions are brief and technical terms are kept to a minimum; an illustrated glossary is provided at the end of the volume and additional fullpage plates demonstrate features that are taxonomically important for some plants, for example Thuya cones, Iris and Crocus flowers, and Hosta leaf blades. One interesting illustration idea provides silhouettes for fern fronds; these seem to be made from photocopies of actual herbarium specimens and while not aesthetically pleasing they serve their purpose adequately.

Although the volume is not itself profusely illustrated, citations of published illustrations and photographs are provided for every species treated. Some of these illustration sources are widely available in the US and others are likely to be found only in a university reference library. If the gardener is willing to seek out these additional books and periodicals, then as many as four illustrations can be found for one species, and the identity for the plant can be established with reasonable certainty. One tricky point is that the name under which the species is illustrated may not be the same as that used in the EGF, and no attempt is made to cross-reference the names.

A feature that is extremely useful for the professional botanist is the citation of references under genera and families that provide a lead into the literature. This provides a "trail of crumbs" to the wealth of information available in technical botanical literature, such as monographs, revisions, and ecological studies. It is to be hoped that lay persons will also make use of these literature citations to discover the added dimensions of knowledge behind many familiar garden plants.

Synonyms, usually names used in trade publications and horticultural works, are provided for many taxa, and these are a valuable cross-reference. A welcome consideration is that all names for the authorities connected with scientific names are spelled out in full, and not abbreviated in the cryptic code that even many botanists find baffling.

Keys are kept as non-technical as possible, and were designed for living plants in hand, and not for working from memory or dried herbarium specimens. The keys are of two kinds: formal dichotomous keys that include descriptive features and lead to individual taxa; and informal keys that use major features to separate groups of taxa. Once one gets the hang of using them, the informal keys can be a rapid means to narrow the search to small pool of possible candidates.

The European Garden Flora has much to offer American audiences, and it will be a long, long while before any comparable work appears on the North American scene. The series is an exciting addition to the horticultural literature, and will be a welcome addition to reference libraries. It is surprising that a work of such significance for horticulture and gardening should be so poorly known in the U.S. It is unfortunate that the publisher did not better publicize the appearance of the second volume, which was published in 1984; consequently sales were poor. To compound this, the print run for the first volume was reduced, based on the poor sales for volume 2. It is certain that the first volume will go out of print and those wishing to order it should not delay. Invest in the whole series is my advice to the commercial nurseryman, serious horticulturist, botanist, garden club, and librarian because this work will stand as a valuable reference for a long time to come.

George Staples
Botany Department
Bishop Museum, Honolulu

AXIS DEER SPREADING ON MAUI

An axis deer was killed on 22 November 1989 in Haleakalā National Park, in the front country, 1.5 miles above the headquarters building. The presence of this animal in the park may be the result of hunting and other disturbance pushing the animals northward from the Polipoli Springs area. However, the population is expanding on Maui and there is considerable concern that control measures be instituted as soon as possible.

The state should make axis deer hunting open to the public on state land on Maui to reduce the threat of significant damage to native ecosystems by the activity of this species. We do not want to see a repeat of the disaster created by axis deer and feral pigs on East Moloka'i.

HONOLULU HI 968
PM
5 APR
1990

Harvey Cushing MD
USA 45

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
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CYANEA OBTUSA AND CYANEA LOBATA (LOBELIACEAE): RECENT APPARENT EXTINCTIONS OF TWO MAUI ENDEMICS

R.W. Hobdy[1], A.C. Medeiros[2] and L.L. Loope[2]

Hawai'i has the highest number of candidate threatened and endangered plant species in the United States (31%), with approximately 10% of the native flowering plants already extinct (Wagner, Herbst and Yee 1985). Whereas relatively good documentation exists for the 19 taxa Federally listed as Endangered by the U.S. Fish and Wildlife Service (Stemmermann 1989), and The Nature Conservancy of Hawai'i is building databases on imperiled taxa (Newman 1989), available knowledge of the status of many of Hawai'i's rare plants is far from adequate. A recent coordinating effort by the Center for Plant Conservation, consolidating the best guesses of field botanists throughout the state, concluded that over 100 taxa in Hawai'i could become extinct in the wild within the next five years (Kerry Walter, pers. comm.). Yet, since the rarest Hawaiian plants grow in remote places, reached by few botanists, the extinction of a species is not often recorded.

We report here on the apparent extinction of two endemic lobeliads of Maui recognized as valid species by Lammers in Wagner, Herbst and Sohmer (1990). They had not been collected or seen for several decades until "rediscovered" in the 1980s.

Cyanea obtusa (Gray) Hillebr. (Section Delissoideae) is a tall (2.5-4.5 m), much-branched shrub of windward and moist leeward rain forest on Maui, especially along the sides of stream courses. The conspicuously serrate (almost dentate) and somewhat brittle leaves are clustered in rosettes at the branch tips. Inflorescences of 6-12 small flowers are clustered below the leaves. The color of the 2.5-4.0 cm long corollas as reported in the literature has varied, ranging from "greyish-blue" (Hillebrand 1888) to "purplish" (Lammers 1990). We observed the flowers of the Kahikinui plants to be very pale blue-purple in color.

Cyanea obtusa was described as *Delissea obtusa* by Asa Gray who listed its distribution as Maui and the Mauna Kea area of Hawai'i island. Hillebrand (1888) transferred the species into the genus *Cyanea*. Hillebrand (1888), Rock (1919), and Wimmer (1956) also listed the distribution of this species as including Hawai'i island. St. John (1973), however, listed the species as

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[1]. DOFAW, P.O. Box 1015, Wailuku, HI 96793.
[2]. Haleakala National Park, P.O. Box 369, Makawao, HI 96768

a Maui endemic. Lammers (1990) considers *Cyanea obtusa* to be restricted to East and West Maui and regards Mauna Kea specimens as *Clermontia pyrularia* Hillebr.

Prior to 1981, this species was known from eight collections made between 1841 and 1919. Among these are collections by the United States Exploring Expedition (1841), H. Mann & W. Brigham (1864-65), W. Hillebrand (1870s), J.F. Rock (1910), and C.N. Forbes (1919). Hillebrand (1888) noted its presence at Honuaula (vicinity of modern Ulupalakua) as well as Waikapu and Lahaina of West Maui.

After the Forbes collection in 1919, *Cyanea obtusa* was not collected again until October 1981 when it was rediscovered on a field trip into remnant cloud forest of Kahikinui on southern Haleakala (*A.K. Kepler 46*, *47*, *48*, and *49* and *A.C. Medeiros 306*). Two large individuals were encountered at 1500 m (4900 ft) and 1590 m (5300 ft) elevation in *Acacia*/*Metrosideros* forest degraded by feral goats, pigs and cattle. Surrounding vegetation included 'olapa (*Cheirodendron trigynum* (Gaud.) A. Heller), 'ohelo-kau-la'au (*Vaccinium calycinum* (Sm.)), *(Phyllostegia ambigua* (A. Gray) Hillebr.), ho'i'o (*Diplazium sandwichianum* (Presl.) Diels.) and other rain forest vegetation.

Damage to native vegetation in the area was so severe that the survival of the lobeliads was due only to their inaccessible position along steep sections of the watercourse. Based on an examination of the material by Dr. Harold St. John (B.P. Bishop Museum), this population was reported as *Cyanea* sp. nov. St. John *ined*. in Medeiros, Loope and Holt (1986).

In 1989, a field trip into Kahikinui to explore the possibility of fencing an area of remnant native vegetation revealed that both previously known individuals of *C. obtusa* in the area had died. The cause of death was not apparent; one individual had died in place recently. An intensive search of the stream sides of the area revealed another previously undiscovered individual; a collection was made (*R.W. Hobdy* and *A.C. Medeiros 3020*). Later in July 1989, RWH accompanied University of Wisconsin botanist Thomas Givnish to the Kahikinui site in order to obtain leaf material for chloroplast DNA analysis. Unfortunately, it was too late as the last known individual of *Cyanea obtusa* had recently died.

Cyanea lobata Mann (Section Genuinae) is a rare, 1.2-2.5 m tall, branched shrub of mesic to wet stream courses. Like *C. obtusa*, the large, sharply lobed leaves are gathered in rosettes at branch tips. The 5-8 cm long flowers are whitish to purple, many clustered densely together under the leaves.

According to Lammers (1990), Cyanea lobata is endemic to West Maui and Lana'i. The Lana'i material (formerly C. baldwinii) is represented by a single collection made in 1919 (G.C. Munro 674, BISH); it has not been seen since on Lana'i. On West Maui, C. lobata is listed by Rock (1919) as occurring at Waihe'e, Wailuku, Ka'anapali, Honokahau and elsewhere.

Cyanea lobata was rediscovered by RWH in rain forest along the steep sides of the main stream of Waikapu Valley, West Maui, in 1982 (R.W. Hobdy 1675, BISH). A single individual was located at 600 m (2000 ft) on the south side of the stream on a steep slope of soil. Surrounding vegetation included 'olona (Touchardia latifolia (Gaud.)), ho'i'o (Diplazium sandwichianum (Presl.) Diels.) and other windward stream bottom species. In 1988, while visiting the Waikapu population, RWH discovered that heavy rains had triggered a large landslide which had eliminated the sole plant of C. lobata.

Rediscovered and lost again in the 1980s, Cyanea obtusa and C. lobata may still survive in remote, unknown locations, likely on steep cliff faces. However, their habitat on East and West Maui is highly degraded by feral ungulates and alien plant invasion, and these two species may never be seen again.

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KAHO'OLAWE
VOLUNTEERS NEEDED

The U.S. Navy is looking for volunteers to propagate and plant native Hawaiian plants on Kaho'olawe Island. The Navy can provide propagation materials (sterile potting mix, dibble tubes, fertilizer) and transportation to and from Kaho'olawe Island when planting occurs. Interested parties should contact Dr. Stephanie Aschmann (808) 471-1691 for further information and/or the native plant list for this program.

SIERRA CLUB LEGAL DEFENSE FUND, INC. LAWSUIT

May 3, 1989

Hon. Manuel Lujan, Jr.
Secretary of the Interior
U.S. Department of the Interior
18th and C Streets
Washington, D.C. 20240

Re: Violation of Endangered Species Act --
Failure to List Endangered Hawaiian Plants

Dear Secretary Lujan:

I am writing on behalf of the Sierra Club and the Conservation Council For Hawaii to notify you, pursuant to the citizen suit provision of the Endangered Species Act ("ESA"), 16 U.S.C. 1540(g)(2), that the United States Fish and Wildlife Service ("Service") is violating Section 4 of the ESA by failing to place approximately 550 "category 1" candidate species of native Hawaiian plants on the list of threatened and endangered species.

A petition to list these species was first accepted by the Service in 1975, and has been pending, in one form or another, ever since. In 1980, the Service itself determined that the listing of these species was warranted. It has repeated that finding annually. As of this date, however, the Service has listed only nineteen Hawaiian plant species. Section 4(b)(3)(B) of the ESA, 16 U.S.C. 1533 (b)(3)(B), allows the Service to postpone the listing of qualified species only if it can demonstrate both that listing is "precluded by (other) pending proposals (to list)" and that it is making "expeditious progress" in adding other qualified species to the list. The Service has not adequately made either demonstration and in fact is not making "expeditious progress" in listing other species; it is therefore violating the law by failing to list these admittedly qualified Hawaiian plant species.

Background

On January 9, 1975, the Smithsonian Institution, acting in accordance with a Congressional directive contained in Section 12 of the ESA, 16 U.S.C. 1541, issued its Report On Endangered and Threatened Species Of the United States (House Document 94-51, the U.S. Government Printing Office 1975). The Smithsonian Report identified over 3,100 native United States vascular plant species which the authors of the Report believed should be candidates for listing as threatened or endangered species. Id., pp. 48-198. Fully one third (1,088) of these were Hawaiian species, 639 of which the Smithsonian Report classified as endangered, 194 threatened, and 255 as possibly extinct. Id., pp. 11; 164-191.

On July 1, 1975, the Service published a "Review of the Status of Over 3,000 Vascular Plants" in which it gave notice that it had received the Smithsonian Report and that it considered the report "to constitute a 'petition' in the context of Section 4(c)(2) of the [ESA] and that ample justification has been presented to warrant a review to determine whether the plants identified in the report should be added to the lists of Threatened or Endangered species." 40 Fed. Reg. 27823, 27824.

Since 1975 the Service has had this list of plants, or some modified version of it, under formal consideration for listing.

On June 16, 1976, the Service published a proposal to list approximately 1,700 of the plants identified by the Smithsonian report as endangered species, including about 894 Hawaii plants. 41 Fed. Reg. 24523, 24526-24572. The Service never acted on this proposal, however, and on December 10, 1979, in response to a 1978 amendment to Section 4 that required the Secretary to withdraw any proposal to list species that had not been made final within two years of the proposal (see 16 U.S.C. 1533(b)(6)(B)(ii)), the Service withdrew it. 44 Fed. Reg. 70796. The Service stated that it nevertheless considered the Smithsonian Report to be a continuing petition to list "the approximately 3,131 plant taxa which have not been the subjects of final rules." Id., p. 70796.

On December 15, 1980, the Service published a comprehensive Notice of Review of all native United States plant taxa then being considered for listing, which "refine[d] and update[d]" the previous notices. 45 Fed. Reg. 82480. The Service noted that the December 10, 1979 withdrawal "was required because of the expiration of the deadline for making such rules final and was not related to the conservation status of the taxa proposed [in the June 16, 1976 listing proposal]," and stated that "[t]he present notice is intended to reflect the Service's current judgment of the probable status of all plant taxa that were included in either previous notices or the 1976 [listing] proposal." Ibid.

The 1980 Notice of Review included 797 Hawaiian plant species as candidates for listing. 592 of these were so-called "category 1" candidates which the Service defined as those

> Taxa for which the Service presently has sufficient information on hand to support the biological appropriateness of their being listed as Endangered or Threatened Species.

It included an additional 205 "category 2" Hawaiian plant species, which were those

> Taxa for which information now in the possession of the Service indicates the probable appropriateness of listing as Endangered or Threatened, but for which sufficient information is not presently available to biologically support a proposed rule.

Id., pp. 82480; 82482-82569.[1]

The 1982 Amendments to Section 4

Thus, by October, 1982 the Service had had under consideration for over seven years a petition to list nearly 600 native Hawaiian plant species that the Service itself acknowledged were in fact qualified for listing (the "category 1" candidates). As of that date, the Service had listed a mere six Hawaiian plants.[2]

The already slow pace of listing slowed to a crawl during the first months of the Reagan Administration. Congress was greatly

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[1] An additional 207 Hawaiian plant species were placed in "category 3", i.e., those no longer being considered for listing. *Ibid*.

[2]

Vicia menziesii	listed April 26, 1978
Kokia cookei	listed October 30, 1979
Haplostachys haplostachya var. *angustifolia*	listed October 30, 1979
Stenogyne angustifolia var. *angustifolia*	listed October 30, 1979
Lipochaeta venosa	listed October 30, 1979
Euphorbia skottsbergii var. *kaleloana*	listed August 24, 1982

See 50 C.F.R. 17.12

concerned with thus situation, and to correct it on October 13, 1982 substantially amended Section 4 of the ESA. Pub. Law 97-304 (Sec. 2). See, e.g., House Report 97-567 (97th Cong. 2nd Sess., May 17, 1982), pp. 9-11, reprinted in 1982 U.S. Code Cong. Admin. News 2807, 2808-2811; Sen. Report 97-418 (97th Cong. 2nd Sess., May 25, 1982), pp. 10-14. Many of the revisions incorporated specific time-tables within which, henceforth, the Service had to make listing determinations.

In particular, new Section 4(b)(3)(A), 16 U.S.C. 1533(b)(3)(A), now required, "to the maximum extent practicable," that within 90 days after receiving a petition to list a species the Service make a finding whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted."

If the Section 4(b)(3)(A) finding is positive, new Section 4 (b)(3)(B), 16 U.S.C. 1533(b)(3)(B), requires the Service, within 12 months after receipt of the petition, to make one of three findings:

(1) that the petitioned action is not warranted;

(2) that the petitioned action is warranted; or that

(3) the petitioned action is warranted, but "is precluded by pending proposals to determine whether any species is an endangered species or a threatened species" and that expeditious progress is being made to add qualified species to [the list of threatened and endangered species]...." 16 U.S.C. 1533(b)(3)(B)(iii)[3].

Thus, Section 4, as amended in 1982, excuses the Service from listing petitioned species whose listing is otherwise warranted only if it can demonstrate both that listing is precluded by "pending proposals" and that the Service is making "expeditious progress" in listing other qualified species.

The Conference Committee that reported out the bill that became the 1982 amendments to the ESA explained this provision as follows:

> If, within twelve months of receiving a petition that warrants the publication of a proposed regulation, the Secretary determines that he is unable to propose such action

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[3] Section 4(b)(3)(B) was not amended by the 1988 amendments to the ESA (Pub. Law 100-478).

> at that time...., he will be excused temporarily from publishing a proposed regulation at that time provided he satisfies several limited conditions.
>
> First, the Secretary must be actively working on other listings and delistings and must determine and publish a finding that such other work has resulted in pending proposals which actually preclude his proposing the petitioned action at that time. Second, the Secretary must determine and present evidence that he is, in fact, making expeditious progress in the process of listing and delisting other species. (Emphasis added.)

Conf. Rep. 97-835 (97th Cong. 2nd Sess., Sept.17, 1982), pp. 21-22, reprinted in 1982 U.S. Code Cong. Admin. News 2860, 2862-2863.

The Conference Committee emphasized that the Secretary would have a heavy burden of justifying his failure to list species whose listing had been found to be warranted. The determinations of "precluded by pending petitions" and "expeditious progress" must be factually grounded and are subject to judicial review:

> In cases challenging the Secretary's claim of inability to propose an otherwise warranted petitioned action, the court will, in essence, be called on to separate justifications grounded in the purposes of the Act from the footdragging efforts of a delinquent agency.
> Ibid.

Moreover, to underscore its intention that the Secretary's reprieve from the mandate to publish a proposed listing for qualified species was only to be "temporary", the Conference Committee went on to note that:

> If the Secretary is excused from publishing a proposed regulation to implement a petitioned action within twelve months after receiving the petition, the Secretary must continue to consider the petition and shall publish the proposed regulation as soon as possible. (Emphasis added.)
> Ibid.

The Senate Committee report emphasized that Congress's main concern was that the Secretary quickly eliminate the backlog of qualified "candidate" species:

> Finally, the Secretary must present evidence that he is, in fact, making efficient and speedy progress in the process

> of listing such other species. With more than 3,000 species already identified as "candidates" for designation as endangered or threatened, the Secretary should make considerably more progress in the listing process than he has during the past 14 months. (Emphasis added.)

Senate Rep. 97-418 (97th Cong. 2nd Sess., May 26, 1982), p.14.

New Section 4(b)(3)(C)(i) provided that a petition that is found to be warranted but precluded "shall be treated as a petition that is resubmitted to the Secretary...on the date of such finding and that presents substantial scientific or commercial information that the petitioned action may be warranted." 16 U.S.C. 1533(b)(3)(C)(i). In other words, a Section 4(b)(3)(B) finding must be made again within 12 months of the first 12-month finding. Con. Rep. 97-835, supra, p.22.

Finally, petitions pending on the effective date of the amendments (October 13, 1982), such as the pending plant petition, were to be treated as having been newly submitted on that date. Ibid; Pub. Lay 97-304, Section 2(b)(1).

Post-1982 Amendment Events

In response to the new amendments, on February 15, 1983 the Service published a review of all petitions pending as of October 13, 1982. 48 Fed. Reg. 6752. Referring to the December 15, 1980 Notice of Review, the Service stated that "With respect to requirements of the new Section 4(b)(3)(A), positive findings already have been made for the petitioned taxa in categories 1 and 2 of the 1980 notice, and findings of lack of substantial information have been made for taxa in category 3." Id., p. 6752. The Service noted that by October 13, 1983 it would have to make the findings required by Section 4(b)(3)(B) for those plant species for which it had made positive Section 4(b)(3)(A) "substantiality" findings (that is, with respect to Hawaiian plants, the 592 "category 1" and 205 "category 2" species). Id., p. 6753.

On November 28, 1983 the Sercive published a Supplement to the December 15, 1980 comprehensive Notice of Review for native plants, in which it added two category 1 Hawaii plant species (*Cyperus pennatiformis* var. *bryanii* and *Lipochaeta porophilla*) to the pending petition. 48 Fed. Reg. 53640, 53648, 53653. The Service stated that "All candidate plant taxa (which are those remaining in category 1 and 2 of the 1980 notice or in those coategories in this supplementary notice) are treated as under petition, and these notices serve for the review of status required by Section 4(b)(3)(A) of the Act as amended in 1982." It promised that "The Service will soon respond separately in the Federal Register to the requirements of Section 4(b)(3)(B) of the Act for appropriate petitioned plants and animals." Ibid.

On January 20, 1984, the Service made its Section 4(b)(3)(B) determination, finding that the listing of all category 1 and 2 plants in either the 1980 Notice of Review or the 1983 Supplement is "warranted but precluded." 49 Fed. Reg. 2485, 2487. The Service repeated that finding the following year. 50 Fed. Reg. 19761, 19762-19763 (May 10, 1985).

On September 27, 1985 the Service published a comprehensive updated Notice of Review of all vascular plant taxa native to the United States that are being reviewed for possible addition to the List of Endangered and Threatened Plants under the [ESA]." 50 Fed. Reg. 39526. The new Notice of Review incorporated the previous notices and "reflect[ed] the Service's current judgement of the possible vulnerability of all native candidate plant taxa." Id., 39526.

The September 27, 1985 updated Notice of Review remains the Service's most recent comprehensive compilation of U. S. plant species under consideration for listing. It includes some 2,517 category 1 and 2 plant taxa overall, 745 of which are Hawaiian species (553 category 1 and 192 category 2). Id., pp. 39528-39584.[4] The Service reiterated that all category 1 and 2 taxa included in the Notice of Review are candidates for possible listing and "are treated as under petition for listing, and this notice initiates the review of status required by section 4(b)(3)(A) of the Act, as amended in 1982." Id. p. 39527.

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[4] In this Notice of Review the Service modified somewhat its definition for "category 1", as follows:

> Taxa for which the Service currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list them as endangered or threatened species.

The "category 2" definition is now

> Taxa for which information now in possession of the Service indicates that proposing to list them as endangered or threatened species is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support the immediate preparation of rules.

Id., pp. 39526-39527.

Since then the Service has published annual notices of "Findings on Pending Petitions and Description of Progress on Listing Actions" in which it has simply repeated each year a finding that listing of the category 1 and 2 plants in the September 27, 1985 undated Notice of Review is "warranted but precluded." See 51 Fed. Reg. 996, 996 (January 9, 1986); 52 Fed. Reg. 24312, 24312-24313 (June 30, 1987); 53 Fed. Reg. 25511, 25512 (July 7, 1988); 53 Fed. Reg. 52746, 52747 (December 29, 1988).

To demonstrate its supposed "expeditious progress" in adding other qualified species to the list, in purported compliance with Section 4(b)(3)(B)(iii), the Service has reported its listing progress in these annual notices as follows: 56 species listed from October 1, 1984 to September 30, 1985 (51 Fed. Reg. 998-999); 51 in 1985-1986 (52 Fed. Reg. 24313-24314); 52 in 1986-1987 (53 Fed. Reg. 25514); and 57 in 1987-1988 (53 Fed. Reg. 52749).

The Federal Register notices do not break down the annual numbers of species added to the list in terms of plants or animals, nor do they provide information as to the various geographic areas of the United States in which these sepcies occur. Our investigation of this matter has revealed that in each year following enactment of the 1982 amendments to Section 4 (October 13, 1982), the Service has listed the following numbers of plants and animal species overall:

	Plants	Animals
1982-1983	2	27
1983-1984	13	31
1984-1985	32	24
1985-1986	28	23
1986-1987	28	24
1987-1988	32	25
TOTAL	135	154
YEARLY AVERAGE	22.5	25.7

For Hawaiian plants and animals, the number of species listed since 1982 is as follows:

	Plants	Animals
1982-1983	1	0
1983-1984	2	0
1984-1985	3	0
1985-1986	7	0
1986-1987	0	0
1987-1988	0	0
TOTAL	13	0
YEARLY AVERAGE	2.2	0

Discussion

Since 1982 the Sevice has been adding, overall, an average of about 50 species to the list each year, roughly half of which have been plants. In Hawaii, the Service has been listing an average of only two plants per year, and no Hawaiian plant has been listed in the last two years. In the six years since the 1982 amendments requiring "expeditious progress" in listing, the Service has listed only thirteen Hawaiian plant species, which added to six that had previously been listed makes a total of nineteen out of the hundreds of admittedly qualified Hawaiian plant species that are awaiting listing.

At this rate of listing, it would take the Service nearly three centuries to place the present backlog of category 1 Hawaiian plant candidate species on the list. The Service has failed utterly to eliminate, or even to reduce substantially, the huge backlog of candidate species about which Congress expressed its concern. In short, this can hardly be the "expeditious progress" in adding "qualified species" to the list contemplated by the Congress in Section 4(b)(3)(B)(iii).

Moreover, the Service has never made an explicit finding that the few listings that have occured have actually "precluded" the immediate listing of all the remaining category 1 candidates, as is also required by Section 4(b)(3)(B)(iii). Thus the Service has not legally met the requirements of that section so as to excuse the Service's continuing postponement of action on the backlog of Hawaiian plant candidates by repeated findings of "warranted but precluded".

Hawaii has, with justification, been called "the endangered species capital of the Country", e. g., most recently, "Extinctions In Paradise: Protecting Our Hawaiian Species" (Executive Summary) (MRDC 1989), p. 2. In fact, more species of plants and animals have gone extinct in Hawaii that in all of North America. See, e.g., Carlquist, Hawaii, A Natural History (Pacific Tropical Botanical Garden 1985), p. 179. The enormous backlog of native Hawaiian plant species that the Service itself has compiled and whose listing the Service has acknowledged to be warranted demonstrates that Hawaii continues to suffer an extinction crisis hugely disproportionate to the rest of the country. If anything, the Service should be focussing relatively greater attention upon and acting with greater dispatch and a greater sense of urgency with respect to Hawaiian endangered species than elsewhere; instead, it seems that the Service has grossly neglected Hawaiian species.

The problem is amplified when one considers that the present backlog of candidate species, large as it is, is only the tip of an immense iceberg of endangered species that could emerge worldwide in the next 20 to 30 years: up to several million species, or as many as a third of all known species on earth, may become extinct in the next several decades, according to some estimates. E.g., Myers, "Tropical Forests and Their Species" (contained in Wilson, "Biodiversity," National Academy Press, 1988), pp. 30-32; Lugo, "Estimating Reductions in the Diversity of Tropical Forest Species" (also in Wilson, "Biodiversity"), p. 59, Table 6-1; Shaffer, "Minimum Viable Populations for Conservation", Cambridge University Press, 1987), p. 69; Wolf, "On the Brink of Extinction: Conserving the Diversity of Life" (Worldwatch Paper 78, Worldwatch Institute, 1987).

Congress was of course aware of and concerned about these trends when it amended Section 4 of the ESA in 1982 so as to allow the Service to postpone listing qualified species only if it could demonstrate both that it was genuinely precluded from listing such species by other action it was taking to protect endangered species and that it was making "expeditious progress" in adding other qualified species to the list. Congress could not conceivably have thought that listing an average of two Hawaiian plants per year in the face of a backlog of hundreds of admittedly qualified Hawaiian plant species (or, for that matter, that listing about 22 plants nationwide or even 50 species overall per year when a backlog of thousands of candidates exists) would constitute "Expeditious progress".

These plants have been under petition for listing for nearly fifteen years, ever since the Service accepted the Smithsonian Report as a petition to list. By its own admission, the Service has had on file since at least 1980 "substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list" the Hawaiian plant category 1 candidates. Thus, no further studies need to be conducted to determine whether these plants should be listed.

In short, there is no reason for the Service not to propose the immediate listing of all pending Hawaiian category 1 plant species. The Service's failure to do so constitutes a violation of Section 4(b)(3)(B) of the ESA, 16 U. S. C. s 1533(b)(3)(B). If the Service does not take satisfactory steps to remedy this violation within 60 days of this notice, we intend to bring appropriate legal action in United States District Court.

Very truly yours,

MICHAEL R. SHERWOOD

cc: Susan Reece Lamson
Deputy Assistant Secretary
Fish and Wildlife and Parks
Department of the Interior, and
Acting Director, U.S. Fish and
Wildlife Service

Allan Marmelstein
Pacific Islands Administrator
U.S. Fish and Wildlife Service

SIERRA CLUB LEGAL DEFENSE FUND SETTLEMENT

MICHAEL R. SHERWOOD
Sierra Club Legal Defense Fund
2044 Fillmore Street
San Francisco, California 94115
Telephone: 415-567-6100

Attorney for the Plaintiffs

DIANE M. CONNOLLY
Environment and Natural Resource Division
Department of Justice
P.O. Box 7369
Benjamin Franklin Station
Washington, D.C.20044-7369
Telephone: 202-633-4185

Attorney for the Defendants

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF HAWAII
Civil No. 89-953 ACK

CONSERVATION COUNCIL FOR HAWAII, et al.,)
Plaintiffs,

v.

MANUEL LUHAN, JR., SECRETARY OF THE INTERIOR, et al.,)

Defendants.

SETTLEMENT AGREEMENT

THIS AGREEMENT is made between all of the plaintiffs and all of the defendants in the above-mentioned case.

The Plaintiffs brought this action in the Federal District Court for the District of Hawaii on December 8, 1989, and the defendants responded with their answer on February 6, 1990. The plaintiffs alleged that the defendants violated the Endangered Species Act, U.S.C. 1531-1544 by improperly failing to propose for listing as endangered or threatened many species of Hawaiian plants. Since the suit was filed; the defendants have adopted and the plaintiffs have concurred with a new taxonomy for those plants which places the number of species in dispute at 186. The defendants have already proposed for listing five of those species, and proposed listings for four other species are near completion.

The parties agree as follows:

1. The defendants will propose for listing a total of fifty of the 186 Hawaii plant species in fiscal 1990 (October 1, 1989 to September 30, 1990). This number includes the nine species already proposed or ready to be proposed in fiscal year 1990.

2. The defendants will propose for listing the remaining 136 Hawaii plant species during fiscal years 1991 (October 1, 1990 to September 30, 1991) and 1992 (October 1, 1991 to September 30, 1992).

3. If, however, available biological data indicate that any of the species in Paragraphs 1 and 2 above are extinct, then there will be no obligation to propose such species for listing. A preliminary determination that a species is extinct will be published in the Federal Register, and the public will have an opportunity to comment on any such preliminary determination.

4. On, or before the end of fiscal year 1991 the defendants will prepare and furnish to plaintiffs' counsel a report stating the progress of the listing efforts during fiscal year 1991 and describing what remains to be done in order to complete the listing process by the end of the fiscal year 1992 as agreed herein.

5. "Propose for listing" means publish a rulemaking in the Federal Register.

6. The defendants acknowledge that the plaintiffs are prevailing parties in this matter and, thus, are entitled to reasonable attorneys fees and costs pursuant to 16 U.S.C. 1540(g)(4). The amount of said fees shall be determined by the court upon submission of the issue to the court for its determination. Plaintiffs shall file an appropriate motion for fees within thirty days of the court's signing of this settlement agreement. Defendants will file their opposition to the motion for fees within thirty days of the date on which they receive the plaintiffs' motion. Plaintiffs will file their reply within two weeks of the date on which they receive the defendants' opposition.

7. The plaintiffs will dismiss this action without prejudice to the bringing of a subsequent action by plaintiffs if necessary to enforce the terms of this agreement, and subject to the determination by the court of reasonable attorneys fees and costs as provided in paragraph 6 above.

Executed this 27th day of April, 1990.

DIANE M. CONNOLLY U.S. Department of Justice Attorney for Defendants	MICHAEL R. SHERWOOD Sierra Club Legal Defense Fund Attorney for Plaintiffs

APPROVED AND SO ORDERED. This case is dismissed without prejudice to the bringing of a subsequent action by plaintiffs if necessary to enforce the terms of this agreement except that the court retains jurisdiction to determine an appropriate fee award as stated in paragraphs 6 and 7 above.

Dated May, 09, 1990

ALAN C. KAY
United States District Judge
District of Hawaii

****

ENDANGERED SPECIES PROPOSALS
CALL FOR COMMENTS

Recently, the U.S. Fish and Wildlife Service published in the *Federal Register* a proposal that the species listed below be determined endangered species. If you have any information that provides factual data on the status of the species, any special consideration that should be taken into account in the decision making process or any other advice or guidance that may be appropriate please advise Dr. Joan Canfield (808) 541-2749 by the date shown by the species name.

Cyanea superba	September 17, 1990
Hedyotis st.-johnii	October 2, 1990
Schiedea apokremnos	October 2, 1990
Argyroxiphium kauense	October 5, 1990

MEMORANDUM FROM MICHAEL R. SHERWOOD REGARDING HAWAIIAN ENDANGERED PLANTS LAWSUIT SETTLEMENT AGREEMENT

By now you have heard that we have settled this case. The settlement is a complete victory for us and for endangered Hawaiian plants. I think it is a remarkable accomplishment of which you can all be very proud!

Enclosed for your files is a copy of the settlement agreement which was approved by Judge Kay and filed in the case on May 9, 1990. As you can see, the U.S. Fish and Wildlife Service has agreed to commence the listing process for 50 of the 186 category 1 candidate plant species over which we sued by October 1, 1990 and to do so for the remaining 136 species within the following two years, by October 1, 1992. (So that we can make sure it's on track, the Service will have to give us a progress report on the last 138 species half-way through the two year period).

This means the Service will formally propose the listing of these species in the Federal Register, which is the first essential step in the listing process. When it publishes the proposals, the Service will solicit comments from all interested parties and may hold public hearings. Normally it must make its final determination within one year of publication of the proposed listing.

In return, we agreed to dismiss the lawsuit, but "without prejudice to the bringing of a subsequent action by plaintiffs if necessary to enforce the terms of this agreement." In other words, we can go back to court if we need to.

The service also agreed to pay attorney's fees and costs in the case. We were not able to agree on the actual amount, however, so that will be determined by the court. Whatever amount the court awards us will go towards paying for this case, and, we hope, will also help allow Sierra Club Legal Defense Fund to continue to bring cases like this in the future on behalf of Hawaii's environment and endangered species.

The magnitude of this settlement can best be appreciated when one realizes that in the seventeen years since enactment of the Endangered Species Act of 1973 the Service has listed a total of only nineteen Hawaiian plants. At that rate of listing, it would have taken the Service about 150 years to list all of the 186 category 1 candidates (i.e., those species the Service itself admitted should be on the endangered species list), a job the Service has now agreed to do in just a few years. Assuming that 186 species are in fact ultimately listed, this will result not only in a ten-fold increase in the number of Hawaiian species on the list but also a doubling of the number of all domestic United States species of plants on the list (from 218 as of January, 1990 to 404), and an expansion by over 33% of the total number of listed domestic species of plants and animals (from 563 to 749).

Once listed it will be illegal to remove, cut, dig up, damage or destroy the plants without a permit whether they occur on federal, state or private land. Moreover, federal agencies will have to "insure" that their actions do not "jeopardize the continued existence" of any of the plant species, and will have to consult the US Fish and Wildlife Service before taking, permitting or funding any action that could do so. Once the plants are listed the Service will have to plan and implement recovery plans for them. Federal funds may become available for habitat protection and acquisition where necessary. Finally, the listing will also provide these plants with legal protection under state law, because Hawaii's endangered species law provides that species that are placed on the federal endangered species list are automatically deemed to be on the State's endangered species list as well.

Although we can be pleased with our success so far, our work will not be complete until the Service finally lists the plants. There may well be opposition to the proposed listings by the State or other agencies or individuals, so it will be crucial for all of us to monitor the process closely, and to comment positively on the proposed listings as they are published in the Federal Register. Marjorie Ziegler and I will keep track of this as best we can, but it will primarily be up to you all to take advantage of the opportunity the lawsuit has created and to comment forcefully on the proposed listings.

It has been a pleasure and an honor to represent you in this matter. If you have any questions, please give me a call or write.

Sent to:
Rick Scudder, CCH
Steve Montgomery, CCH
Lola Mench, SC
Alan Burdick, SC
Thomas Ranker, HBS
Arnold Lum, SCLDF
Marjorie Ziegler, SCLDF

PEOPLE'S WATER CONFERENCE #7
INTEGRATING WATER AND LAND USE PLANNING IN HAWAII

HAWAII STATE CAPITOL AUDITORIUM
JANUARY 12, 1991
8:30 A.M. TO 3 P.M.

PURPOSES:
1. To set climate and prepare for the 1992 Review of the State Water Code;
2. To report on each island's water use plan; and,
3. To discuss implementing water use plans into land use decision making.

PROGRAM:
1. Each island will be invited to report on its water plan which the Water Code requires to be adopted by ordinance.
2. State and county water and land use officials will be invited to discuss land use decisions and respond to county plans.
3. The keynote speaker will comment and wrap up.

KEYNOTE SPEAKER:
Gregory Thomas, Chief Executive for The Natural Heritage Institute, a California based environmental management consulting firm. Thomas has taught law at the University of California, other U.S. universities, and as a Fulbright Scholar in the People's Republic of China. He has worked with the Natural Resources Defense Council, The Sierra Club Legal Defense Fund and other environmental and governmental agencies. He has authored many publications on resource law, management and protection.

PEOPLE'S WATER CONFERENCES are FREE and OPEN to any interested persons or groups. If you wish to comment or participate, please contact:

Martha Black, Chair
229 Poipu Drive
HONOLULU HI 96825
Phone: 395-2127

PEOPLE'S WATER CONFERENCES, INC. is a non-profit, educational corporation formed to provide a platform for public dialogue on important water issues among diverse interests in the community. This is in line with Section 1. Chapter XI, Hawaii State Constitution which mandates the CONSERVATION AND DEVELOPMENT OF RESOURCES for the benefit of Hawaii's present and future generations.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
HONOLULU HI 96822

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Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1990

Executive Council

President:	Tom Ranker (UH Evolutionary Biology Programs)
Vice-President:	Don Drake (UH Botany Department)
Treasurer:	George Staples (Bishop Museum Botany Department)
Secretary:	Benton Pang (UH Botany Department)
Directors:	Mark Merlin, General Science Dept., U.H. Isabella A. Abbott, University of Hawaii

Committees (appointed by the Executive Council)

Membership:	Donald P. Gowing, B. P. Bishop Museum (Chair)
Newsletter:	Clifford Smith, University of Hawai'i (Editor)
Conservation:	Steven Montgomery, University of Hawaii
Science Fair	Rylan N.S. Yee, Data House
Native Plants:	Clifford Smith, University of Hawai'i (Chair) Ken Nagata, Lyon Arboretum Evangeline Funk, University of Hawaii John Obata, B. P. Bishop Museum Art Medeiros, Haleakala National Park

* * *

MEMBERSHIP

The Society year is from December 1 through November 30 of each year.

Regular Membership is $7.50 per year.
Student Membership $4.00.
Family Membership $10.00; and,
Life Membership (individuals only) $150.00.

Life and Honorary Members pay no further dues.

HAWAIIAN BOTANICAL SOCIETY SECRETARY'S ANNUAL REPORT

1989

The year 1989 was an interesting year for the Society. The Officers were:

President-	Mark Merlin
Vice-president-	Marie Bruegmann
Secretary-	Patti Welton
Treasurer-	Derral Herbst
Directors-	Lyndon Wester Isabella Abbott

This year Lyndon Wester continued to eradicate troublesome plants from the Marsilea population at Koko Head. Volunteers twice a month in the wet season have been very successful.

At the beginning of the year Dr. Abbott announced that the state had allocated $80,000 to the Department of Agriculture for research on controlling Myrica faya. The Nature Conservancy of Hawai'i called for proposals for conservation biology projects in Hawaii. This was part of a small grants program under the Hawai'i Conservation Biology Initiative. The Society awarded prizes to the three winners of the Hawaiian Science and Engineering Fair. They were Dianella Howarth, Gar Ling Tse, and Lorene Sato.

In the fall President Merlin visited the new Xeriscape Garden at the Halawa Board of Water Supply and encouraged people to use xerophytic plants in their gardens as well. Steve Montgomery announced that one fourth of one percent of H-3's landscaping cost must be spent on native plants. A committee of members of the Society was proposed to advise the landscapers. Steve Montgomery also informed the Society about the Sierra Club Legal Defense Fund's law suit against the U.S. Department of Interior for failing to list Hawaiian plants as endangered species. In 1975 the Smithsonian Institute published a list of species which should be protected, yet this report had not been acted upon. The aim of this law suit was to have these species federally listed as endangered which would insure them protection under the Endangered Species Act of 1974. The Society supported the law suit with $300.

In December a summary of The Natural Resource Defense Council's Forum on Endangered Species in November was reported. The top priorities for protecting endangered species were education and land acquisition. Diane Ragone, new Program Botanist with the Hawai'i Plant Conservation Center at the National Tropical Botanical Garden called for proposals for those who want to grow, propagate, and study native plants. Barrie Morgan announced that the Nature Conservancy of Hawai'i is looking for a preserve manager for their preserve in Koko Head for the water fern *Marsilea*. And a new slate of officers were elected.

The Speakers this year were:

JANUARY

Plant of the Month- Dr. Mark Merlin spoke about an undescribed species of palm in the South Cook Islands.

Speaker of the Month- Dr. Sam Gon III: "Biological Surveys of the Natural Area Reserves of Hawaii."

FEBRUARY

Plant of the Month- Dr. Ron Fenstemacher told us the history of 'Awa, (*Piper methysticum*) in Hawaiian.

Speaker- Dr. Vincent Lebot: "Kava: The Potential of a Plant in Oceania: Awa (*Piper methysticum*)."

MARCH

Plant of the Month- Sue-Hwei Chang talked about *Eucheuma alvarezzii*, a red alga grown commercially for carrageenan.

Speaker- Candace Lutzow: "The Ethnobotany of the French Caribbean People of St. Thomas."

APRIL

Plant of the Month- Patti Welton spoke about *Citharexylum caudatum* (Verbenaceae) a shrub which has naturalized in the back of Mänoa and windward Oahu.

Speaker- Dr. Jim Juvik compared primary succession on volcanic islands around the world.

MAY

Plant of the Month- Ken Marr told us about the taxonomic problems in the Hawaiian species of *Zanthoxylum* (Rutaceae).

Speaker- Dr. Art Whistler described the uses of "Tongan Herbal Medicine."

JUNE

Plant of the Month- Isabel Meneses informed us about the species of *Gracilaria*, a cosmopolitan genus of red algae eaten locally and grown commercially collected for agar.

Speaker- Bill Garnet told us about "The Work of the Private Garden in Hawai'i in Conserving Native Plants."

OCTOBER
Plant of the Month- Zella Ellshoff showed slides of Prairie Plants of Ohio.
Speaker- Dr. Fred Ganders summarized his work with "Adaptive Radiation in Hawaiian Bidens (Asteraceae)."

NOVEMBER
Plant of the Month- Dr. Art Whistler told us about the genus Gardenia in Polynesia.
Speaker- Diane Ragone's topic was on the variety of breadfruit cultivars around the South Pacific.

DECEMBER
Speaker- Dr. Mark Merlin spoke about "The Ecological Diversity and Traditional Uses of the Plants of Belau (Republic of Palau)."

HAWAIIAN BOTANICAL SOCIETY
Minutes of the December 1989 Meeting

President Mark Merlin called the meeting to order at 7:35 p.m. The minutes of the November meeting were read and approved. New members of the society, Dr. Tom Ranker, Dr. Genie Trapp and Gail Chun were approved.

The election of the new officers was held. The results were as follows: Tom Ranker (UH Evolutionary Biology Program) as President, Don Drake (UH Botany Department) as Vice-President, Benton Pang (UH Botany Department) as Secretary, and George Staples (Bishop Museum Botany Department) as Treasurer. Dr. Isabella Abbott (UH Botany Department) will continue on the Board of Directors together with the retiring President.

Under old business, Steve Montgomery reported that the lawsuit which the Sierra Club Legal Defense filed against the U.S. Fish and Wildlife for not acting quickly on the Endangered Species Act was still at a stalemate. He was waiting for a promised reply from the lawyers at that time. He said 182 species of native Hawaiian plants are in Category 1 as candidate endangered species, that is, they are considered most at risk. Dr. Allen Marmelstein, Director, Honolulu Office, U.S. Fish and Wildlife, is only authorized to promise the listing of 20-30 species each year. The excuse is that the Secretary of the Department of Interior, Manuel Luhan Jr. has to undo a number of complicated rules which James Watt set up concerning endangered species.

He also summarized the Natural Resource Defense Council's Forum in November on Endangered Species. The Forum called together conservation groups statewide, the State Department of Land and Natural Resources, and the U.S. Fish and Wildlife Service to vocalize what they believed were priorities for the preservation of Hawaii's endangered species. The two most prevalent priorities were educating the public, beginning with the youth, and land acquisitions to be designated as nature reserves.

Under new business, the new Program Botanist with the Hawai'i Plant Conservation Center at the National Tropical Botanical Garden Ms. Diane Ragone made a call for proposal for those who want to grow, propagate and study native plants. The garden recently received $279,000 from the MacArthur Foundation for this project.

Dr David Fisher asked the Society if they would like to continue awarding prizes to the winners of the State High School Science Fair. All were in favor.

Barrie Morgan spoke for The Nature Conservancy of Hawai'i (TNCH) about their Preserve in Koko Head for the water fern *Marsilea*. They are looking for a preserve manager who can take care of the logistics of setting up tours for interested groups as well as report both to the Society and TNCH on the health of the Preserve and the *Marsilea* population. Anyone interested should contact her at TNCH.

There was no Plant of the Month Speaker. President Mark Merlin was the Speaker of the Month. His Topic was: The Ecological Diversity and Traditional Uses of the Plants of Belau (Republic of Palau). He went there this past summer to help coordinate an environmental education program for their teachers. He showed us slides representing the variety of the vegetation zones as well as slides of the interesting endemic flora.

Respectfully submitted,
Patti Welton, Secretary.

HAWAIIAN BOTANICAL SOCIETY
Minutes for January, 1990 meeting

President Tom Ranker called the meeting to order at 7:30 p.m. Approval of the minutes for the December meeting were postponed until the February meeting. The Treasurer's report was read by the secretary, Benton Pang, in the absence of the treasurer, George Staples.

Dr. Gerald Carr introduced Dr. Don Farrar of Iowa State University as a new guest to the meeting. He is the luminary professor in the Botany Department at the University. Don Gowing, membership chairman, introduced a new member to the Society, Linda Burnham-Larish, and noted that Ron Fenstemacher had become a life member.

Vice President Don Drake informed the audience there was no January plant of the month speaker. He then introduced the speaker of the month, Dr. Gerald Carr, Professor of Botany at the University of Hawai'i, Mänoa. The title of his talk was "The Origin and Evolution of Hawaiian Tarweeds". He discussed the 38 Hawaiian plant species comprising the silversword alliance and their variation in morphology and habitat. He touched upon the genetic cohesiveness between these species and their continental counterparts, the California-Tarweeds. His present research has led him to successfully crossing the 2n pollen of a hybrid of Madia bolanderi and Rallardiopsis murii, both California Tarweeds, with Dubautia scabra. The F1 progeny may lead to conclusive genetic evidence of the possible ancestry of the Hawaiian silversword alliance. The audience was excited to hear about his research, see the plants involved in the crossing, and looked forward to hearing his final results.

Respectfully submitted,
Benton Pang, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes for February, 1990 meeting

President Tom Ranker called the meeting to order at 7:35 p.m. The minutes of the December meeting were then read by last year's secretary Patti Welton and accepted. Minutes of the January meeting were read and accepted. The Treasurer's report was read and accepted.

Don Gowing, membership chairman, introduced three new members into the Society: Johnson Hew, Mike Sherwood, and Carl Young. All three were accepted. He also informed the Society of the death of one of our long-time members, Milton Manhoff.

Unfinished business: A letter from Richard Smith, deputy director of the US Fish and Wildlife Service regarding the

Sierra Club Defense Fund lawsuit was read. He proposes to get 20-30 plant species listed this year and continue listing this number of species until the back log is completed.

Vice President Don Drake introduced the Plant of the Month speaker, Mr. Tim Motley who spoke on the "Ethnobotany of Acorus calamus or Sweetflag. Sweetflag is a medicinal plant whose use can be traced to the Bible. Some of its historic uses included: an aphrodisiac, a hallucinogen, and a contraceptive. Today, it is used for stomach cramps, malaria, typhoid, colds, and sore throat, as well as an insecticide, antiseptic and as a fixative in some perfumes.

Speaker of the month was Mr. Kanehiro Kitayama who presented "Plants of Mt. Kinabalu, Borneo". This continental non-volcanic granite mountain reaches 4000 m at its peak. Kanehiro's beautiful slides took us through his 1984 expedition to this highest point in Southeast Asia. Beginning with the lowland jungle we were introduced to methods of collecting parts of trees over 200 ft tall using a shotgun and slingshot. The lower montane forest contains many conifers and oaks with a rich assemblage of herbaceous understory. The upper montane forest contained a variety of rhododendrons, mosses, tree ferns, and the worlds largest pitcher plants. He then showed the pictures of alpine and subalpine zones. He concluded with a discusison of the heavy disturbances these days on Mt. Kinabalu due to lowland farming, mining, and logging.

Respectfully submitted,
Benton Pang, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes for March, 1990 meeting

President Tom Ranker called the March meeting to order at 7:38 p.m. The minutes of the February meeting were read and accepted. The Treasurer's report was also read and accepted.

Don Gowing, membership chairman, introduced new members into the Society: Erika Littlehale and the family of Edward Johnston and Helen Rogers. All were welcomed.

Unfinished business: Notification from U.S. Fish and Wildlife Service was directed to Sierra Legal Defense Fund with a new offer regarding the federal listing of Hawaiian plant species. The new offer calls for the preparation of packets and proposed listings for 50 species plus the 10 already being reviewed, by September 1990. The remainder 136 species will be listed during the next 2 fiscal years at about 70 species per year.

New business: Back-issues of most of the Society Newsletters are available to those interested in the lobby of St. John Building.

Dr. Mark Merlin moved the Society recognize Derral Herbst as an honorary member due to his 9 years as treasurer for the Society. The motion was carried.

Dr. Steve Montgomery informed the Society of Earth Day on April 22nd and asked the Society donate money for the making of the Earth Day poster for Hawai'i. The President was not able to directly assess how much the Society could donate but with the acceptance by the treasurer, $100-200 could be donated and would be discussed at the next board meeting.

The President read a letter from Dr. William Theobald, Director of National Tropical Botanic Gardens inviting the Society for an all-day tour of the Kaua'i gardens with lunch, dinner, and transportation to be provided by NTBG.

The Secretary informed the Society of a symposium on Xeriscape by the Board of Water Supply.

Dr. Dave Fisher informed the members that since the Society committed itself to support the Science Fair, no money has since been appropriated. The ommission was corrected.

The Vice President introduced the Plant of the Month speaker, Mr. Wayne Borth, on 'a'ali'i (Dodonea viscosa). This large shrub can be found in dry forest regions of Hawai'i. The plant provided good hard wood for the Hawaiians, as well as a medicine, and the ornamental seed capsules are used today, in lei haku. Most of Wayne's talk was about the Yellow's Disease of 'a'ali'i, his PhD. dissertation topic. Plants with the disease are found mostly in the upper elevations of the dryland forest and characterized by normal green foliage interspersed with diseased yellow and reddish branches, very reminiscent of witches brooms. He asked the Society membership to inform him on any 'a'ali'i plants we might see with disease to further his research.

Speaker of the month was Dr. Sy Sohmer, Chairman, Bernice Pauahi Bishop Museum Botany Department, who spoke on the

Hunstein River Expedition in Papua New Guinea. After a brief introduction on the initial formation of the expedition and Bishop Museums' involvement, he outlined the two main objectives of the study, 1) a botanical study focusing on the tree species, and 2) an animal survey focusing on the vertebrate species. Methodology included 6 months of field work in Papua followed by laboratory work, identification and cataloging, at Bishop Museum. The slide presentation showed us the beauty of alluvial forests, and lowland and montane rainforests in Papua New Guinea, the field conditions of the expedition, and the hope for a successful study with the collaboration with all six of the institutions involved. A National Geographic Society article of the expedition is set for the October 1990.

Respectfully submitted,
Benton Pang, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes for April, 1990 meeting

The President called the meeting to order at 7:35 p.m. The minutes of the March meeting were read and accepted. The Treasurer's report was read and accepted.

Don Gowing, membership chairman, introduced three new members to the Society: John Strazanac, Cynthia Fritsler, and Linda Cuddihy. All three were accepted. He also informed the Society of the death of one of our members, Kathryn Orr, a nutritionist at the University of Hawai'i, Mänoa.

Don Gowing also announced that the Society Newsletter would be made available after the meeting.

Unfinished business: A letter from Diane Connelly of the Department of Justice regarding the endangered species lawsuit against the U.S. Fish and Wildlife Service was read which requested the plaintiffs, Sierra Legal Defense Fund and the Hawaiian Botanical Society to drop the lawsuit because a settlement will be reached out of court. It was moved and carried by the members present that the Society drop the lawsuit pending the decision of the coplaintiffs, Sierra Legal Defense Fund. It was also asked that the 186 total species proposed for list be published in the next Newsletter. It will be published in the next issue.

A motion was passed that the Society donate $100.00 toware the cost of the making and distributing of the Earth Day, Hawai'i poster.

The members were asked to write to their congressional delegates to consider the construction of a plant quarantine facility in Hawai'i Volcanoes National Park that primarily focuses on evaluating plant pathogens as biocontrol agent of alien plants. Currently, the quarantine facility can only be used to study insects as potential biological control agents.

The Vice President introduced the Plant of the Month speaker, Dr. Donald Farrar from the University of Iowa and luminary professor at the university. His topic addressed the abundance of the filmy fern, Callistopteris sp. He has found it growing abundantly in the wettest parts of Mänoa and Pälolo Valleys on O'ahu and the rainforests on Hawai'i. Its abundance is due, in part, to its ability to perpetuate itself in a gametophytic stage. The 1 cm. gametophytes are usually found along the walls of trails or on rocks in streams and the sporophytes are rarely found.

The speaker of the month was Dr. Donald Falk, director for the Center for Plant Conservation. He outlined three main ideas or concepts behind the Center's conservation efforts: 1) integrated conservation; 2) survival pathways at the species level so it may be reintroduced into nature; and, 3) movement beyond conservation. He illustrated types of endangerment, the plant species that are currently endangered, and the idea of land acquisition for area preservation. He ended with the conservation attempts currently being done in Hawai'i and applauded Hawai'i's dedicated efforts in preserving its endangered and fragile flora.

Respectfully submitted,
Benton Pang, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes for May, 1990 meeting

President Tom Ranker called the meeting to order at 7:35 p.m. The minutes of the April meeting were read and accepted. The treasurer's report was read and accepted. Joan Stewart, research assistant to Dr. Abbott at the University was introduced as a guest.

Don Gowing, membership chairman, introduced new members Wayne Borth and Eileen Heering (family) and Linda Nelson to the Society. All were welcomed

Old business: The Earth Day, Hawai'i, poster was distributed after the meeting.

New business: The Society congratulated Neil Wruebl for winning the 'most outstanding botanist' award from the Botanical Society of America. Neil was an undergraduate this past fall semester for the Botany Department at the University of Hawai'i, Mänoa.

Plant of the month speaker was our President, Dr. Tom Ranker, who changed his original topic of Peperomia to Adenophorus. Adenophorus, in the fern family Grammatidaceae, is one of three endemic fern genera in Hawai'i. It has been separated into 2 subgenera: Adenophorus with 6 species and Oligadenus with 4 species. His slides highlighted most of the species in Hawai'i, their characteristic morphological features and habitats that distinguish them from one another.

The speaker of the month was Dr. Donald Farrar, Iowa State University. He introduced his talk by discussing the important role gametophytic gemmae play in some ferns. Gametophytic gemmae are dispersal units that detach from the parent unit. In ferns, the gametophytic gemmae allow the gametophyte to grow in areas under extremes that would not support a sporophyte. Only 10% of the ferns comprising three families produce gametophytic gemmae, the Grammitidaceae, Vittariaceae, and Hymenophyllaceae. Dr. Farrar discussed his research in the Appalachians at Dry Falls where the only Grammitidaceae of the continental United States grows. This population of only Xiphopteris gametophytes has lead Dr. Farrar to conclude that the gametophytic gemmae allow the fern to persist with no sporophyte because of the freezing winters that are unsuitable for that particular life stage. In Hawai'i, he has observed similar processes, but temperature may not be such a limiting factor for the sporophytes. Some of the genera observed having gametophytic gemma populations are Vittaria, Adenophorus, Grammitis, Mecodium, Vandenboschia and Callistopteris. Hopefully, in time Dr. Farrar can continue his research in Hawai'i to better understand the role gametophytic gemmae play in ferns.

Respectfully submitted,
Benton Pang, Secretary

NOTES ON WEEDS IN HAWAII - V

Clifford W. Smith

Asteraceae

Senecio mikanoides Otto ex Walp. (German or Italian ivy)
A few plants found by Winona Char on the lower portion of Mauna Kea Ranch in gulch areas, 2,200 to 3,000 ft. elevation. The vines were in a rather poor condition. Perhaps it is too wet for the plants which are normally found in much drier habitats.

Basellaceae

The new flora notes that Anredera cordifolia (Ten.) Steenis (Madeira vine) is "now sparingly naturalized probably on all of the main islands." Art Medeiros recently located a heavy infestation on Pu'u Mähoe, East Maui at 2,600 feet in the Arboretum area. The species was previously known in the islands under the name Boussingaultia cordifolia.

This species has been proposed for listing as "noxious" by the State Department of Agriculture because of its behavior elsewhere in the tropics. I did not include it in my list of alien species that pose a serious threat to native Hawaiian ecosystems because it was so uncommon. This discovery by Art suggests that more aggressive action needs to be taken against it before its population really explodes.

Oleaceae

Jasminum fluminense Vell.
This plant is a very vigorous climber with fragrant white flowers and black fruit. Winona Char has found large plants in a strip of kiawe forest between Kahului Airport and Sprecklesville Beach Lots, Maui. She has also found plants in koa-haole/Guinea grass scrub on the slopes behind U.H. faculty housing on 'O'ahu; this latter record is a new island record.

Olea europaea subsp. africana (Mill.) P. Green
(olive, 'oliwa)
This subspecies of the olive is beginning to appear sporadically in some of Winona Char's surveys in dry forest areas on the Big Island, e.g., around Pu'uanahulu, in the 'ohi'a forest makai of Pähala and Highway 11. It is already recognized as a serious pest around the 'Äinahou Ranch.

Polygalaceae

The new flora records the presence of Polygala paniculata L. (a milkwort) on East Maui as well as O'ahu and Hawai'i. Art Medeiros indicates that it is now present in Kïpahulu Valley.

It is also present on West Maui at Lïhau and Hana'ula. Art notes that it is spreading very rapidly along ditch roads.

Rosaceae
Rubus niveus Thunb. (Hill or mysore raspberry)
Several scattered shrubs were found by Winona Char bordering Koholalele Gulch, Hawai'i, on the Mauna Kea Ranch (formerly Küka'i au Ranch) between 3,000 and 2,600 ft. elevation. The young stems were very glaucous -- bluish, waxy; the veins on upper surface of leaflets deeply impressed; and fruits reddish-black, subglobose.

Rubiaceae
Cinchona pubescens Vahl (quinine)
This record needs verification by comparing the collection (vegetative plants only) with the Bishop Museum material. A few plants have been found by Winona Char in a Christmas berry dry forest association, on a large 'ä'ä lava flow above Ka'alu'alu, Kä'u, between 600-800 ft elevation.

The continued range expansion of this species is of major concern. This species is among the worst weeds in the Galapagos and St. Helena.

Solanaceae
Art Medeiros has expressed considerable concern about the spread of Solanum seaforthianum Andr. (no common name) on West Maui. He has noted its widespread distribution in the Kaupö to Kïpahulu region of East Maui.

ENVIRONMENTAL ISSUES IGNORED AGAIN

A recent publication from the East-West Center, "Hawai'i as an East-West Bridge: A Survey of the Economic Value of Non-Tourist International Activities in Hawai'i" by A.A. Smyser omits all reference to the significant contributions of environmental and conservation science, particularly natural resource management, in Hawaii. The omission is all the more surprising because one would have thought that East-West Center scholars in the Environment and Policy Institute and Resource Systems Institute would have reviewed the document and commented. Microbiological control of soil-born pathogens is the only area mentioned, but larger fields, such as biological control, are not even though state and federal agencies are spending considerable amounts of money here and abroad, as well as attracting foriegn dollars to the programs and training foreigners here in the technology. Feral animal and alien plant control techniques that are increasingly used elsewhere are also not included. Scientists are attracted to the Islands from around the globe; they come to study various aspects of island biology, particularly our endemic organisms and ecosystems, as well as the havoc created by the uncontrolled exploitation of Hawaiian resources and importation of alien species from around the globe. All in all, these programs contribute millions of dollars each year to the our economy.

Hawai'i is truly a bridge in all of these areas. Academic, environmental and resource management studies supported by the resources and facilities of a developed country serve not only the Pacific, but the tropics in general. It is time that the "powers that be" begin to recognize the leadership role of Hawaiian environmental and natural resource management science. It is most unfortunate that an East-West Center document should ignore this area. However, it is not at all surprising. Many international conferences and policy discussions groups are sponsored at Mänoa by East-West Center, but are essentially "closed door" to Hawaiian scholars, suggesting that Hawai'i has nothing to offer. It is a grave disservice to Hawai'i, its scientific community, natural resource managers and local conservationists.

Clifford W. Smith
Botany Department, UHM.

HONOLULU HI 968
PM
23 JUL
1991

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
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Newsletter
Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

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MEMBERSHIP

The Society year is from December 1 through November 30 of each year.

Regular Membership is $7.50 per year.
Student Membership $4.00.
Family Membership $10.00; and,
Life Membership (individuals only) $150.00.

Life and Honorary Members pay no further dues.

ON THE NAME OF THE WEEDY PASSIFLORA KNOWN AS BANANA POKA

Peter Green
Royal Botanic Gardens
Kew, Richmond,
Surrey TW9 3AB UK

It goes without saying that unequivocal names are essential for meaningful communication, and, combined with accurate identifications, are basic to progress in biological research. Furthermore, such naming and identification is particularly important where plants of economic imortance are concerned, and amongst these may be counted the noxious weeds. In Hawai'i the attractive, pink-flowered Passiflora which is commonly called Banana Poka is without doubt one of the more serious of weeds. In 1975 the area it covered was assessed at 95,000 acres on the island of Hawai'i and at 12,000 acres on Kaua'i (Warshauer et al. 1983, La Rosa 1984: 22). Since then it has spread even further.

Although this plant has passed under the botanical name Passiflora mollissima, as for example, in the new Manual (Wagner et al. 1990), critical taxonomic examination shows that although it is closest to that species it is not quite the same. Yet the Hawaiian weed accurately matches introduced populations in other parts of the world, for example in East Africa (de Wilde 1975: 15) and New Zealand (Young 1970: 161). It should be noted, moreover, that throughout its range in Hawai'i (and in the other areas mentioned) its morphology is remarkably uniform, with none of the variation one would expect in a genetically normal species. Could it be agamic in some way or other?

Attempts are being made to find a biological control to stop and reduce this serious weed. However, essential to this research is not only an accurate identification, but a precise nomenclature. Insects are often very good taxonomists, critically identifying their host plants, and to call the Banana Poka, P. mollissima, is misleading, and may help to account for difficulties encountered in trying to find a biological control, and for some of the failures (see Island Plant Conservation Newsletter No. 2: 1, 1989).

Passiflora mollissima is a native of tropic South America where Dr Linda Escobar, the authority on Passiflora, has studied the genus for many years and has extensive experience of the plants in the field. In correspondence, she has stated that she believes the Hawaiian plant has come from an introgressed population of *P. mollissima*, and from her knowledge of the species in the wild has suggested that the introgressing species is *P. cumbalensis*, with our plant a stabilized introgressant. This would explain the uniform distinctness of Banana Poka from true *P. mollissima*, but what should it be called?

In nomenclature, interspecific hybrids may be indicated by a formula which combines the names of the parental species, or, if the hybrid is of significance, by a Latin binomial which applies only to hybrids between those particular species (e.g. *Bougainvillea glabra* X *peruviana*, or *Bougainvillea* X *buttiana*). A hybrid binomial could be formally proposed for the Banana Poka, but this would scarcely be desirable, for not only is there an element of speculation over its exact parentage, but any name proposed would apply to all offspring of that interspecific cross and not just to Banana Poka, for which a particular name is required.

According to Degener, Degener & Gunn (1973), our plant "was introduced to hide an outhouse in Hawai'i early during the Twentieth Century". It was presumably introduced from cultivation, for it was known and grown under glass in Europe in the last century, or at least at the century's turn, when many species of *Passiflora* were introduced from South America to be grown in the then fashionable conservatories. The details of its introduction to cultivation in Hawai'i are now quite unknown, but it almost certainly came from a cultivated source and not direct from the wild. It can scarcely be called a subspecies or a variety, and the rank of form is usually used for entities which differ by one, or few genes (e.g. f. *alba* or f. *hirsuta*). However, within the International Codes of Nomenclature the appropriate mode for naming such a plant would be as a cultivar. So to provide a suitable name for this serious weed of Hawai'i I propose that it should be called cultivar 'Banana Poka' and should take the form *Passiflora* 'Banana Poka." The name is unequivocal and can be used without any of the overtones from a potentially misleading specific name.

Its distinguishing characters may be described as follows: stem tomentose, scarcely angled; stipules small and early caducous; leaves tomentose below, glabrous above except for the nerves, and divided to about a quarter of their length; petiolar glands sessile; peduncles 3.5--4 cm long, drooping; hypanthium glabrous externally, (5--)6--7(--7.7) cm long; sepals glabrous, 4.5--5(--5.5) cm long.

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HAWAIIAN ENDANGERED PLANT SPECIES LISTING
SETTLEMENT AGREEMENT
PROGRESS REPORT: FY 90

Date: May 23, 1990 Time Left: 18 weeks
Species Proposed to Date: 5

	Proposed		Final
Published	*Isodendrion hosakae* *Remya* (3 spp.) *Wilkesia hobdyi*	5	
Washington Review in Progress	*Cynanea superba* NA PALI CLUSTER: *Hedyotis st.-johnii* *Schiedea apokremnos*	3	
Regional Review in Progress	*Argyroxiphium kauense* *Geranium arboreum* *Marsilea villosa* *Stenogyne kanehoana* WAHIAWA CLUSTER: *Cyanea undulata* *Dubautia pauciflorula* *Hesperomannia lydgatei* *Labordia lydgatei* *Viola helenae*	9	*Isodendrion hosakae* *Remya* (3 spp.)
Field Office in Prep.	KOKEE CLUSTER (6 spp.) LANAI CLUSTER (7 spp.) WAIANAE CLUSTER (ca. 26 spp.)	39	*Wilkesia hobdyi*
	TOTAL	56	

ENDANGERED PLANT SPECIES LISTING ACTIVITIES PROPOSED FOR FISCAL YEAR 1990

FINAL RULES

Isodendrion hosakae: to PDX 11 May 1990.
Remya kauaiensis: to PDX 31 January 1990.
Remya mauiensis: to PDX 31 January 1990.
Remya montomeryi: to PDX 31 January 1990.
Wilkesia hobdyi: in prep.

PROPOSED RULES

Abutilon eremitopetalum
Argyroxiphium kauense: to PDX 11 May 1990.
Chamaesyce halemanui:
Cyanea macrostegia var. gibsonii
Cyanea superba: to PDX 6 April 1989. DC Review.
Cyanea undulata: to PDX 26 March 1990.
Cyrtandra munroi
Dubautia latifolia:
Dubautia pauciflorula: to PDX 26 March 1990.
Gahnia lanaiensis
Geranium arboreum: to PDX 29 August 1989.
Hedyotis st.-johnii: to PDX 19 March 1990.
Hesperomannia lydgatei: to PDX 26 March 1990.
Isodendrion hosakae: published 10 October 1989.
Labordia lydgatei: to PDX 26 March 1990.
Marsilea villosa: to PDX 28 February 1990.
Phyllostegia glabra var. lanaiensis
Poa sandwicensis:
Poa siphonoglossa:
Remya kauaiensis: published 2 October 1989.
Remya mauiensis: published 2 October 1989.
Remya montgomeryi: published 2 October 1989.
Schiedea apokremnos: to PDX 19 March 1990.
Stenogyne campanulata:
Stenogyne kanehoana: to PDX 6 December 1989.
Tetramolopium remyi
Viola helenae: to PDX 26 March 1990.
Viola lanaiensis
Wilkesia hobdyi; published 2 October 1989.
Xylosma crenatum:

PACKAGE 1: NIHOA ISLAND

1	AMARANTHUS BROWNII	AMARANTHACEAE
1	PRITCHARDIA REMOTA	ARECACEAE
1	SCHIEDEA VERTICILLATA	CARYOPHYLLACEAE

PACKAGE 2: WAI'ANAE MOUNTAINS, O'AHU

1	ABUTILON SANDWICENSE	MALVACEAE
1	ALSINIDENDRON OBOVATUM	CARYOPHYLLACEAE
1	ALSINIDENDRON TRINERVE	CARYOPHYLLACEAE
1+	CENTARIUM SEBAEOIDES [K,O,Mo,WM]	GENTIANACEAE
1	CHAMAESYCE CELASTROIDES VAR. KAENANA	EUPHORBIACEAE
1	CHAMAESYCE KUWALEANA	EUPHORBIACEAE
1	CYANEA PINNATIFIDA	CAMPANULACEAE
1?	DIELLIA FALCATA	POLYPODIACEAE
1	DUBAUTIA HERBSTOBATAE	ASTERACEAE
1	GOUANIA MEYENII	RHAMNACEAE
1	HEDYOTIS DEGENERI	RUBIACEAE
1	HEDYOTIS PARVULA	RUBIACEAE
1+	HESPEROMANNIA ARBUSCULA [O,WM]	ASTERACEAE
1	LIPOCHAETA LOBATA VAR. LEPTOPHYLLA	ASTERACEAE
1	LIPOCHAETA TENUIFOLIA	ASTERACEAE
1+	LOBELIA NIIHAUENSIS [Ni,K,O]	CAMPANULACEAE
1	NERAUDIA ANGULATA	URTICACEAE
1+	NOTOTRICHIUM HUMILE [O,EM]	AMARANTHACEAE
1	PHYLLOSTEGIA MOLLIS	LAMIACEAE
1	SANICULA MARIVERSA	APIACEAE
1	SCHIEDEA KAALAE	CARYOPHYLLACEAE
1	SILENE PERLMANII	CARYOPHYLLACEAE
1	TETRAMOLOPIUM FILIFORME	ASTERACEAE
1	TETRAMOLOPIUM LEPIDOTUM SSP. LEPIDOTUM	ASTERACEAE
1	URERA KAALAE	URTICACEAE
1	VIOLA CHAMISSONIANA SSP. CHAMISSONIANA	VIOLACEAE

PACKAGE 3: MOLOKA'I ISLAND

1	BIDENS WIEBKEI	ASTERACEAE
1+	BRIGHAMIA ROCKII [Mo,L,M]	CAMPANULACEAE
1	CANAVALIA MOLOKAIENSIS	FABACEAE
1	CLERMONTIA OBLONGIFOLIA SSP. BREVIPES	CAMPANULACEAE
1	CYANEA MANNII	CAMPANULACEAE
1+	HEDYOTIS MANNII [Mo,L,WM]	RUBIACEAE
1	HIBISCUS ARNOTTIANUS SSP. IMMACULATUS	MALVACEAE
1+	PHYLLOSTEGIA MANNII [Mo,EM]	LAMIACEAE

1	PRITCHARDIA MUNROII	ARECACEAE
1	SCHIEDEA LYDGATEI	CARYOPHYLLACEAE
1	SILENE ALEXANDRI	CARYOPHYLLACEAE
1+	SILENE LANCEOLATA [K,Mo,L,H]	CARYOPHYLLACEAE
1	STENOGYNE BIFIDA	LAMIACEAE
1	TETRAMOLOPIUM ROCKII	ASTERACEAE

PACKAGE 4: KO'OLAU MOUNTAINS, O'AHU

1	CHAMAESYCE DEPPEANA	EUPHORBIACEAE
1	CYANEA TRUNCATA	CAMPANULACEAE
1	CYRTANDRA CRENATA	GESNERIACEAE
1	CYRTANDRA POLYANTHA	GESNERIACEAE
1+	EUGENIA KOOLAUENSIS [O,Mo]	MYRTACEAE
1+	HESPEROMANNIA ARBORESCENS [O,Mo,L]	ASTERACEAE
1	LOBELIA OAHUENSIS	CAMPANULACEAE
1	ROLLANDIA CRISPA	CAMPANULACEAE
1	TETRAPLASANDRA GYMNOCARPA	ARALIACEAE

PACKAGE 5: HAWAI'I

1+	CLERMONTIA LINDSEYANA [EM,H]	CAMPANULACEAE
1+	CLERMONTIA PELEANA [EM,H]	CAMPANULACEAE
1	CLERMONTIA PYRULARIA	CAMPANULACEAE
1	COLUBRINA OPPOSITIFOLIA	RHAMNACEAE
1	CYANEA COPELANDII SSP. COPELANDII	CAMPANULACEAE
1	CYANEA HAMATIFLORA SSP. CARLSONII	CAMPANULACEAE
1	CYANEA SHIPMANII	CAMPANULACEAE
1	CYANEA STICTOPHYLLA	CAMPANULACEAE
1	CYRTANDRA GIFFARDII	GESNERIACEAE
1	CYRTANDRA TINTINNABULA	GESNERIACEAE
1	HESPEROCNIDE SANDWICENSIS	URTICACEAE
1	HIBISCADELPHUS GIFFARDIANUS	MALVACEAE
1	HIBISCADELPHUS HUALALAIENSIS	MALVACEAE
1+	ISCHAEMUM BYRONE [Mo,M,H]	POACEAE
1+	MARISCUS FAURIEI [Mo,L,H]	CYPERACEAE
1	NOTHOCESTRUM BREVIFLORUM	SOLANACEAE
1	OCHROSIA KILAUEAENSIS	APOCYNACEAE
1	PLANTAGO HAWAIENSIS	PLANTAGINACEAE
1+	PORTULACA SCLEROCARPA [L,H]	PORTULACACEAE
1	PRITCHARDIA AFFINIS	ARECACEAE
1	SILENE HAWAIIENSIS	CARYOPHYLLACEAE
1+	ZANTHOXYLUM HAWAIIENSE [Mo,L,M,H]	RUTACEAE

PACKAGE 6: KAUA'I

1+	BRIGHAMIA INSIGNIS [Ni,K]	CAMPANULACEAE
1	CYANEA ASARIFOLIA	CAMPANULACEAE
1	CYRTANDRA LIMAHULIENSIS	GESNERIACEAE
1	DELISSEA RHYTIDOSPERMA	CAMPANULACEAE
1	EXOCARPOS LUTEOLUS	SANTALACEAE
1+	HEDYOTIS COOKIANA [K,H]	RUBIACEAE
1	HIBISCUS CLAYI	MALVACEAE
1	LIPOCHAETA FAURIEI	ASTERACEAE
1	LIPOCHAETA MICROANTHA	ASTERACEAE
1	LIPOCHAETA WAIMEAENSIS	ASTERACEAE
1+	LYSIMACHIA FILIFOLIA [K,O]	PRIMULACEAE
1	MELICOPE HAUPUENSIS	RUTACEAE
1	MUNROIDENDRON RACEMOSUM	ARALIACEAE
1	NOTHOCESTRUM PELTATUM	SOLANACEAE
1+?	PEUCEDANUM SANDWICENSE [K,Mo,M]	APIACEAE
1	PHYLLOSTEGIA WAIMEAE	LAMIACEAE
1	POA SANDVICENSIS	POACEAE
1	PTERALYXIA KAUAIENSIS	APOCYNACEAE
1	SCHIEDEA SPERGULINA VAR. SPERGULINA	CARYOPHYLLACEAE
1+	SOLANUM SANDWICENSE [K,O]	SOLANACEAE

PACKAGE 7: MAUI

1+	ACAENA EXIGUA [K,WM]	ROSACEAE
1+	ALECTRYON MACROCOCCUS [K,O,EM]	SAPINDACEAE
1	ARGYROXIPHIUM SANDWICENSE SSP. MACROCEPHALUM	ASTERACEAE
1+	BIDENS MICRANTHA SSP. KALEALAHA [L,M]	ASTERACEAE
1+	CLERMONTIA OBLONGIFOLIA SSP. MAUIENSIS [L,M]	CAMPANULACEAE
1+	CYANEA LOBATA [L,WM]	CAMPANULACEAE
1	CYANEA MCELDOWNEYI	CAMPANULACEAE
1	GERANIUM MULTIFLORUM	GERANIACEAE
1	LIPOCHAETA KAMOLENSIS	ASTERACEAE
1	LYCOPODIUM MANNII	LYCOPODIACEAE
1+	LYCOPODIUM NUTANS [O,M]	LYCOPODIACEAE
1	LYSIMACHIA LYDGATEI	PRIMULACEAE
1+	MELICOPE KNUDSENII [K,EM]	RUTACEAE
1+	MELICOPE MUCRONULATA [Mo,EM]	RUTACEAE
1	SCHIEDEA HALEAKALENSIS	CARYOPHYLLACEAE

PACKAGE 8: K, O, Mo, L, M, H

1	ADENOPHORUS PERIENS	POLYPODIACEAE
1	BONAMIA MENZIESII	CONVOLVULACEAE
1	DIELLIA ERECTA	POLYPODIACEAE
1+	FLUEGGEA NEOWAWRAEA [K,O,Mo,EM,H]	EUPHORBIACEAE
1	HIBISCUS BRACKENRIDGEI	MALVACEAE
1	OPHIOGLOSSUM CONCINNUM	OPHIOGLOSSACEAE
1+	PLANTAGO PRINCEPS [K,O,Mo,M,H]	PLANTAGINACEAE
1+	SOLANUM INCOMPLETUM [K,Mo,L,M,H]	SOLANACEAE
1+	SPERMOLEPIS HAWAIIENSIS [K,O,Mo,M,H]	APIACEAE

TO BE ASSIGNED

1	ASPLENIUM FRAGILE [EM,H]	POLYPODIACEAE
1	DIPLAZIUM MOLOKAIENSE [K,O,Mo]	POLYPODIACEAE
1	MARISCUS PENNATIFORMIS [La,K,O,M,H]	CYPERACEAE
1	NERAUDIA SERICEA [Mo,L,M,Ka]	URTICACEAE
1	PRITCHARDIA AYLMER-ROBINSONII [Ni]	ARECACEAE
1	PTERIS LIDGATEI [O,M]	POLYPODIACEAE
1	SESBANIA TOMENTOSA [Ne,N,HI]	FABACEAE
1	VIGNA O-WAHUENSIS [Ni,O,Mo,L,M,Ka,H]	FABACEAE

BOTANY DEPARTMENT
University of Hawaii
3190 Maile Way
Honolulu, Hawaii 96822

Red Cloud
10 USA

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29
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Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1990

Executive Council

President: Tom Ranker (UH Evolutionary Biology Programs)

Vice-President: Don Drake (UH Botany Department)

Treasurer: George Staples (Bishop Museum Botany Department)

Secretary: Benton Pang (UH Botany Department)

Directors: Mark Merlin, General Science Dept., U.H.
Isabella A. Abbott, University of Hawaii

Committees (appointed by the Executive Council)

Membership: Donald P. Gowing, B. P. Bishop Museum (Chair)

Newsletter: Clifford Smith, University of Hawai'i (Editor)

Conservation: Steven Montgomery, University of Hawaii

Science Fair Rylan N.S. Yee, Data House

Native Plants: Clifford Smith, University of Hawai'i (Chair)
Ken Nagata, Lyon Arboretum
Evangeline Funk, University of Hawaii
John Obata, B. P. Bishop Museum
Art Medeiros, Haleakala National Park

* * *

MEMBERSHIP

The Society year is from December 1 through November 30 of each year.

Regular Membership is $7.50 per year.
Student Membership $4.00.
Family Membership $10.00; and,
Life Membership (individuals only) $150.00.

Life and Honorary Members pay no further dues.

RETURNING KUMARA VARIETIES TO NEW ZEALAND (AOTEAROA)

Isabella A. Abbott
Department of Botany
University of Hawai'i, Manoa
3190 Maile Way
Honolulu HI 96822

In late 1988, nine varieties of sweet potatoes (kumara in the central and southern Polynesian dialects, or 'uala in Hawaiian) that had been sent to Japan for propagation but were no longer grown in New Zealand (Aotearoa) were returned to that southern outpost of Polynesia.

During the February 1988 Pacific Island-wide ethnobotany meeting in Christchurch, New Zealand, the elders of the Pu Hao Rangi Maori Resource Center in Auckland heard that Douglas Yen (now of the Australian National University) had sent to Japan 617 varieties of sweet potatoes from throughout the world. Among those were three traditional, pre-European Maori varieties. The elders were determined to visit Japan to bring back these varieties that had first come in the ancestral canoes from central and southwestern Polynesia (perhaps the Marquesas Islands and the Society Islands). In November, 1988, four elders from the Resource Center travelled to Japan and in a formal ceremony in Tsukuba, gifts of value were exchanged for the kumara. The Japanese scientists showed great care and consideration as they appreciated the spiritual values placed on these kumara by the Maori people.

Upon their return with the kumara to New Zealand, the elders participated in a Maori ceremony of welcome in Auckland, sponsored by the Department of Scientific and Industrial Research (DSIR). After traditional speeches, the kumara were received by the Botany Division, and later transported to Christchurch where they have been growing to be tested for viruses and other diseases that they might contain. Once they have been cleared of disease, they will be maintained in the Crop Research Division of the DSIR as well.

I thank my colleague Dr. Murray Parsons of DSIR, Christchurch, for the information contained in this paper. Since Hawai'i was one of the last places that Dr. Yen visited to study sweet potatoes, it is unlikely that any of the Hawaiian varieties that he found upon his late arrival matched any of the Maori varieties. When Dr. Handy was doing research on Hawaiian economic plants in the 1930's, he reported 230 folk names of 'uala varieties, but there are fewer than 6 to which one can attribute a Hawaiian name with characteristics not shared with the many introduced varieties from both the eastern and western Pacific.

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HAWAIIAN BOTANICAL SOCIETY
TREASURER'S REPORT
(1 December 1989 through 30 November 1990)

Funds on hand as of 1 December 1989			4,771,54
INCOME:			+1,655.89
Dues		862.50	
Life Memberships		150.00	
Interest		235.29	
Neal-Miller Fund		400.00	
miscellaneous (refund on overpayment)		8.10	
EXPENSES:			-1,947.80
Photocopies & Postages		543.93	
Newsletter		557.96	
Refreshments		71.03	
Gifts and Donations		774.88	
Conservation Council of Hawaii (posters)	100.00		
Science Fair cash prizes (2 @ $50)	100.00		
Science Fair prizes (books)	74.88		
Waimea Arboretum Found. (video monitor)	400.00		
Friends of Foster Garden (subsidize lecture)	100.00		
Society's worth as of 30 November 1990			$4,479.63

Respectfully submitted,
George Staples, Treasurer

LETTER TO THE SOCIETY

June 1, 1990

Enclosed please find the enclosed check as my contribution to the Neal-Miller Fund. As before, I assume that the Society's finances are in adequate shape for day-to-day operations, and that a contribution to the Neal-Miller Fund would better serve the long-range interests of the Society by building principal.

After re-reading the Society's minutes from one of the more recent newsletters, I would like to suggest that the Society increase the size of its awards at the annual Hawai'i Science Fair. As I understand it, the Society gives out 2 prizes of $25.00. This is an entirely inadequate amount, in my opinion. In the late 1960s, when I was in school, I recall that the Science Fair prizes awarded by the Society were at the $25.00 level. Surely inflation has reduced the value of award to less than half its 1968 value. I propose that the Society increase its award to at least $100.00 each. We all give lip service to encouraging educational excellence; I don't see why we can't do more to reward scientific achievement in our students. Perhaps we should set up a special endowment to fund our annual awards. At an 8 percent interest rate, a principal of $2,600 would be sufficient to fund 2 annual awards. I would be willing to contribute $100.00 to such a fund.

On a related note, I think the Society should develop a list of potential botanical or ecological research projects as a guide for students interested in entering the Science Fair. I envision something more than a simple list of potential projects. Rather, the list of subject areas would be accompanied by brief descriptions of the general problem area and suggestions for specific investigations. For example, a general subject would be identifying new plant compounds in native Hawaiian plants. The description of the research topic would explain the possibility of finding new plant compounds with antibiotic, anti-viral, or insecticidal potential, provide a brief bibliography of lay and scientific articles, a list of potential plants related to species from which compounds of proven efficacy have been found, and some guidance on basic approaches for testing for efficacy. The guide would be updated every two years or so by the Society. The argument that students should be self-motivated to find this information ignores the fact that students have only a limited knowledge of the possibilities for research, and need guidance in directing their energies and investigations to specific topics.

Another related action that the Society could take would be to act as a clearinghouse for matching students with interests in the botanical and ecological sciences with researchers, governmental agencies and non-profit groups (such as the Sierra Club of Hawaii, Nature Conservancy of Hawaii) in unpaid and paid internships for high school and college students. A stipend of $1000 for a high school student, or $2000 for a college student would not be unreasonable.

My final suggestion is that a committee should be formed to determine whether the Society should publish, by itself or in conjunction with one or more other organizations, a bi-monthly magazine on gardening in Hawaii. The benefits would be three-fold. First, the magazine would be an admirable extension of the educational goals of the Society. Second, we could help promote progressive ideas on environmentally-sensitive gardening, landscaping with native Hawaiian plants, protection and restoration of native ecosystems, protection of endangered plant taxa, and sustainable ("organic"/natural) tropical and subtropical farming and agricultural industry in Hawaii. The field of sustainable agriculture is growing in importance and acceptance by the scientific and farming communities. Such farming has special relevance to Hawaii, because of the potential to make Hawai'i self-sufficient in vegetables and fruits, instead of the ridiculous practice of importing vegetables and fruits from the Mainland. The Society should take active steps to publish articles and focus attention on sustainable farming, as adapted for Hawaii. I might also note that such farming may also have positive effects on the use of vast areas in Hawai'i as pasture. Third, we could increase our membership. Financially, this would increase our ability to support worthwhile research and botany-related activities, as well as fund awards and scholarship for scientific achievement in students. If the Society cannot undertake the venture by itself, perhaps it could join forces with one or more organizations such as the Garden Club of Hawaii, the Friends of Foster Garden, or the Outdoor Society. Another possibility would be to seek funding through an outside investor, who would share profits (but not editorial control).

The reason I offer these ideas is because of my perception of the Society as an essentially moribund organization. The relative inactivity of the Society appears to stem from its limited financial budget. However, this can be a self-fulfilling prophecy, since no one wants to pay dues for an organization which does nothing, yet the reason nothing is done is because there are no funds. I believe the Society needs to take more active steps to increase its impact in the community on the subjects of native ecosystem preservation, environmentally sensitive gardening, and sustainable agriculture for Hawaii. I don't think we should duplicate what other groups have staked out for themselves; e.g., we should not attempt ourselves to engage in the land acquisition activities of The Nature Conservancy. We should instead concentrate on areas which are directly related to the institutional goals of the Society. This is not to say that we shouldn't cooperate with other organizations in those areas in which we have special expertise. Using the example of The Nature Conservancy again, I think that the Society's joint development of a management plan for the *Marsilea* preserve on East Oahu with The Nature Conservancy is a very good example of how the Society can provide help in its area of expertise. Another would be the leading of interpretive hikes on botany for the various City and County arboreta and gardens (e.g., Hoomaluhia), the Lyon Arboretum, and so forth.

I'm not sure who or what Society committee should be looking into these ideas. However, I would appreciate it if you sent along my ideas to the proper persons or committees.

Sincerely,

Geary S. Mizuno
815 C Street, N.E.
Washington, D.C. 20002

Dr. Donald P. Gowing responded on 14 June 1990 for the Society.

Your letter with the generous contribution to the Neal-Miller Fund found its way to me today. (The Society mail slot at the U/H Botany Department is checked as the opportunity arises, these days when the University is not in regular session.) I think Derral Herbst, Daniel Palmer, and Bill Bush are the present trustees, and will see one or more of them tomorrow evening, and they do make thoughtful use of the funds.

I will indeed try to see that your letter is passed on to the officers of the Society and to the editor of the Newsletter. To this end, I am assuming your permission to make some copies of it (for a couple of committees, too) since the Executive Council may not meet again until the next regular Society meeting in October.

The points you raise are highly important, and do deserve most prompt attention. Certainly, the programs you advise are more ambitious than the Society has seen in several years. But they may require a more committed membership than the Society has had in several years. The implementation of your proposals could provide fuel for a more active and healthy society.

And so, my thanks for your efforts and interest. too.

Sincerely,

Donald P. Gowing

****

A NOTE FROM THE TREASURER

It is necessary to point out that the Society does not actually have the use of the full amount of funds reported for its checking account because the dues paid for life memeberships (amounting to $2,650.00) are held in escrow. Our operating funds are actually $1,829.63 ($4,479.63-2,650.00 = $1,829.63).

Members will also note that during 1990 we spent about $290 more than we earned; see the Treasurer's Report presented on page 56. The Hawaiian Botanical Society is not a money-making organization; we have no other sources of income besides our membership dues and interest paid on funds in the bank. The society is approached by many worthwhile organizations for funds during each year. Far from being a "talking Society and not a doing society" as has been said at a recent meeting, we actually do a great deal considering our limited means, as detailed above. In the coming year members will need to consider carefully our commitment of the Society's funds to good causes, however, because we are not generating enough income to cover our present level of expenditures.

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HAWAIIAN BOTANICAL SOCIETY
Minutes for June, 1990 meeting

President Tom Ranker called the meeting to order at 7:35 p.m. on 4 June 1991. The minutes of the May meeting were read and accepted. The Treasurer's report was read and accepted.

Dr. Donald Gowing, membership chairman, informed the Society of the death of J. Scott Pratt, a member who had worked at the Hawaiian Sugar Planters Experiment station, and also volunteered at the Bishop Museum, NTBG, and Foster Gardens.

Unfinished business:
The Lawsuit with the U.S. Fish and Wildlife Service (USFWS) was officially settled. The agreement: USFWS will process 50 of the 188 catagory 1 species by October of this year and 136 species by October 1992; a total of 186 species in three years. The Society will be informed of the progress as each species is proposed and listed.

New Business:
Waimea Falls Arboretum requested $500 from the Neal/Miller endowment fund to purchase a video monitor. The executive commitee recommended awarding $400. Treasurer George Staples moved the Executive Committee's recommendation which was approved unanimously by the members present.

Plant of the month speaker was Secretary Benton Pang, on the Plants of Haleakala, Maui. His slides featured the trails and plants of Hosmer Grove and Halemau'u.

Speaker of the month was Dr. Lu Eldredge, Pacific Science Association, on the Gardens and Fountains of Rome. His slide presentation was compiled during his year in Italy. He featured public landscapes, private and public gardens and the fountains found in the many beautiful areas of Italy. His presentation was well received and refreshments were served afterwards.

Respectfully yours,
Benton Pang, Secretary

HAWAIIAN BOTANICAL SOCIETY
Minutes for October 1990 meeting

The meeting was called to order at 7:30 p.m. on 1 October 1991. Dr. Don Gowing announced the resignation of President Ranker, and due to the temporary absence of Vice President Drake, he would preside at the recommendation of the Executive Committee. The minutes of the June meeting were read and accepted. The Treasurer's report including his note regarding the cautionary status of the Society's finances was read and accepted. A thank-you note from Waimea Arboretum was read.

Dr. Gowing, membership chairman, introduced new members: Debra Evans, Peter Galloway, Mark White, Richard Palmer, and Scot Medbury. All were welcomed.

New Business:
The British Museum wanted copies of the Newsletter and we offered to send a set and if copies are needed of missing issues they would have to pay for it. A letter was sent but no reply has been received to date.

The Berlin Botanic Garden asked to exchange their journal Willdenowia for the Newsletter. The Executive Committee agreed to the exchange and keep the copies at Bishop Museum. The membership agreed with the Committee's decision.

Evangeline Funk suggested that the Society write to the City and County Parks director to begin a 2-3 acre coastal lowland park at the Makapu'u end of Sandy Beach. After discussion Heidi Bornhorst agreed to take members interested to the site for further evaluation. Those interested were told to meet on the 13th of October at the end of Sandy Beach and Makapu'u at 8:30 a.m.

Mark Merlin informed the Society of an editorial in the Honolulu Advertiser about growing native plants coordinated by NTBG and Lyon Arboretum.

George Staples said the Society was approached by the Friends of Foster Garden to help sponsor a talk by Dr. Wu Xyung on October 14 at Dillingham Hall, Punahou School. They are asking for $200. The Executive Committee Board supports the venture and recommended a contribution of $100.00. The members present approved.

There was no Plant of the month speaker

Speaker of the month was Dr. George Staples, principal editor of the In Gardens of Hawai'i II Project at Bishop Museum. His talk was part of his PhD. research on the genus Porana (Convolvulaceae). He presented slides of his six month trip through India, China, S. China, Bangkok and Central Burma. After describing the genus, he showed the different habitats occupied by the genus. He also presented illustrations of the many botanical gardens and herbaria that he visited and the botanists he met. The talk was very well-received by the audience. Refreshments were served afterwards.

Respectfully yours,
Benton Pang, Secretary

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PACIFIC SCIENCE CONGRESS, 17 MAY - 2 JUNE 1991

The 17th Pacific Science Congress will meet at the Sheraton Waikiki Hotel in Honolulu next year, and the theme of the Congress is "Toward the Pacific Century: The Challenge of Change". There are six themes in the scientific program, all multidisciplinary in approach, according to the Preliminary Program given in the Second Circular:-

Global Environmental Change - Pacific Aspects
Population, Health and Social Change
Science and Culture
Biological Diversity
Technologies for Development: Prospects for the 21st Century
Dynamics of the Earth and the Heavens: The Pacific Arena

There may well be symposia of interest to the members of the Society under all of these themes, but those which specifically mention botanical topics are as follows:-

Neem (*Azadirachta indica*) for pest control
Pacific agroforestry and sustainable development
The power of **kava**
The Botanist and the Pacific
History of the forest economy of the Pacific Basin
Comparative vegetation ecology of the Pacific Islands
Medicinal plants of the Pacific Region.
Status of Pacific ferns
The species concept in Hawaiian flowering plants
Allelochemical approach to the research of plant diversity
Sandalwood in the Pacific Region
Biotechnology: Application to agriculture, etc.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
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